

Appendix C | Large Wood Risk Assessment Memorandum

TECHNICAL MEMORANDUM



To: Stephen Kolk, U.S. Bureau of Reclamation; Scott Bailey, Chelan County Natural Resources

From: Inter-Fluve, Inc.

Date: May 31, 2024

Project: Lower Chiwawa Area D 30% Design

Re: Large Wood Structure Risk and Stability Analysis

1. INTRODUCTION

Inter-Fluve has designed several configurations of large wood structures (LWS) for the Lower Chiwawa Area D Habitat Enhancement Project. This memorandum provides documentation on the preliminary LWS design criteria, considerations, and key assumptions, as well as an overview of the design methodology that will be used in the stability analyses in future design phases. The project plans show the LWS configurations and future design phases will specify the type of ballast (e.g., soil backfill, timber piles/vertical snags, or self-ballast) that will be needed to achieve the target stability factors of safety.

2. DESIGN CRITERIA

The proposed LWS for this project are designed to balance the geomorphic and habitat objectives with the management of risks to public safety and property damage. This is especially critical during the first 1 to 3 years following construction, before planted riparian vegetation will have a chance to mature and thereby provide hydraulic roughness and contribute to LWS stability.

2.1. RISK AND STABILITY ANALYSIS

Using the risk matrices provided in the USBR's Large Wood Material Risk Based Design Guidelines (Knutson et. al., 2014), risk categories for public safety and property damage are assessed in the following subsections. Given the subjective methods for assessing the level of risk associated with each sub-category in the matrices, a representative range of potential risk was assigned for the various characteristics defined on each axis of the matrices.

2.1.1. Public Safety Risk

Public safety risks pertain to the hazards caused by LWS or LWM within the wetted perimeter of stream that can cause harm to people in and around the stream, particularly recreational users and children (Knutson et al., 2014). The public risk evaluation matrix weighs the characteristics of a LWS (generalized for all LWS types proposed in the project area in this analysis) versus the general characteristics of public users of the river in the project area to place bounds on the overall risk of proposed LWS to public safety. Figure 1 shows the results of the public safety risk analysis performed for LWS proposed in the project area. Table 1 and 2 document the rationale used to inform scoring of the public safety risk matrix.

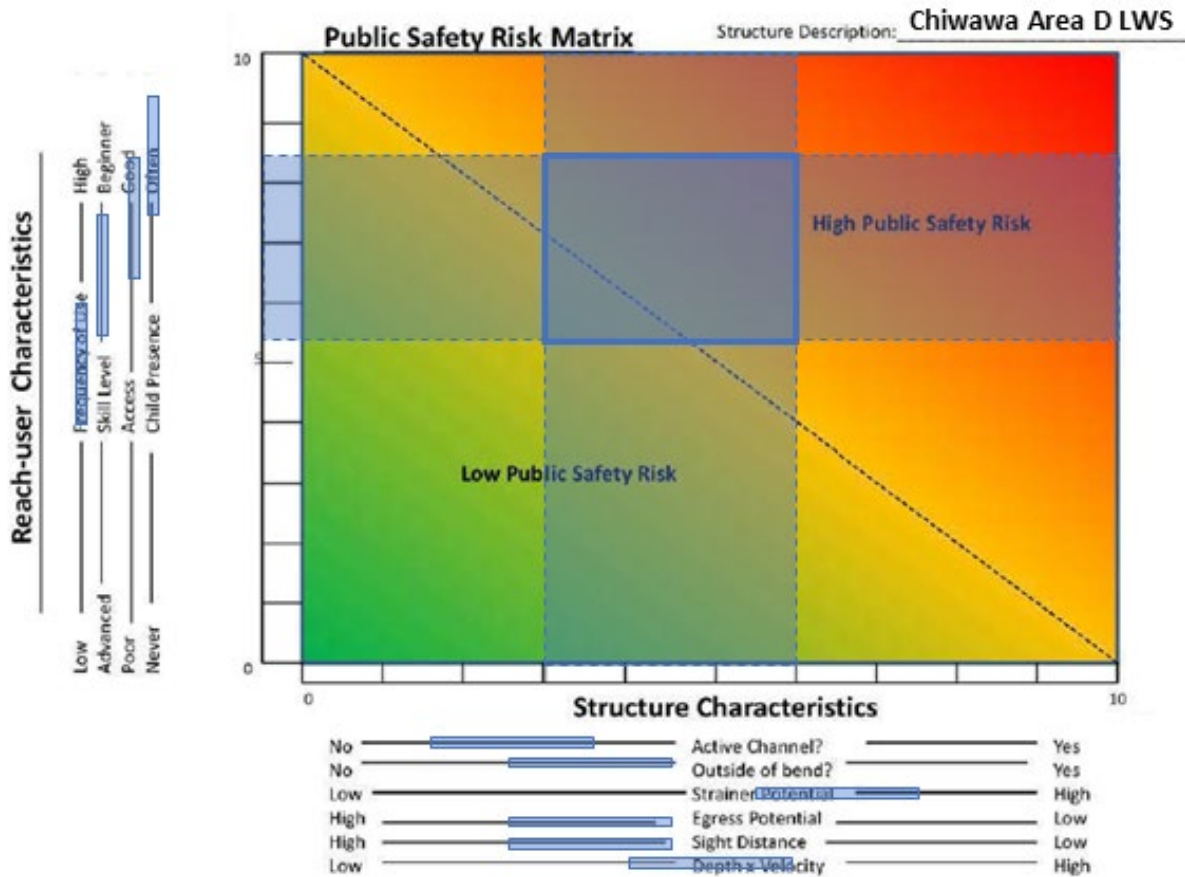


Figure 1: Public safety risk matrix annotated with project-specific scoring for LWS proposed in Chiwawa Area D.

The assessment of structure characteristics (x-axis) rates proposed LWS placements with in this reach as a moderate risk for public safety. In most cases, structures are in locations where they are of lower risk to recreational users floating the river (e.g., inside of bends, easy to avoid, adequate sight distance), yet some structures have the potential to act as strainers under some flow condition, or if additional wood racks against the structures. Table 1 provides details about assessed structure risk rating and the justification for each rating factor. The assessment of reach-user characteristics (y-axis) yields a “high” risk rating. Easy access to the river for those with limited experience recreating and swimming in rivers, and high potential for children in the river in the project area drive this rating. Table 2 provides details about assessed reach-user risk rating and the justification for each rating factor.

Table 1: Overview of LWS structure characteristics for evaluating public safety risk.

<u>Structure Characteristics Factor</u>	<u>Risk</u>	<u>Justification</u>
<u>Active Channel</u>	Low	Channel migration and channel geomorphic complexity in the project area is low. Bedrock and coarse-grained terraces bound the channel through much of the project area.
<u>Outside of Bend</u>	Low - Moderate	Only a few of the LWS proposed in the project area are located on the outside of major bends in the river.
<u>Strainer Potential</u>	Moderate – High	Several LWS are positioned at the apex of mid-channel bars, and are likely to trap additional mobile LWM following their construction. Therefore, these structures have high potential to develop into strainers. Other LWS styles have lesser projection into the channel and are less likely to trap as much mobile wood.
<u>Egress Potential</u>	Low – Moderate	At flow conditions where most recreation occurs, most structures are located in areas where water is easily wadable or swimmable, and in many cases the banks are easily scalable. At the downstream side of the project area banks are higher and steeper, but less recreational use is anticipated in this area.
<u>Sight Distance</u>	Low – Moderate	Proposed LWS are generally not located in areas with limited sight distance, and in the few cases where LWS are located behind bends, the LWS are generally located in areas of lower velocity allowing boaters time to react.
<u>Depth & Velocity</u>	Moderate	Flow is generally wadable in the vicinity of most proposed LWS under the flow conditions where most bank-accessed recreation occurs. LWS that have higher-risk hydraulics are commonly harder to access for most recreational users.

Table 2: Overview of reach-user characteristics for evaluating public safety risk.

<u>Reach-User Characteristics Factor</u>	<u>Risk</u>	<u>Justification</u>
<u>Frequency of Use</u>	Moderate	The project area is used for a variety of recreational uses, but overall boating use on the Lower Chiwawa is not as common as some other rivers in the Upper Wenatchee basin. Use is anticipated to be primarily related to people camping and staying in cabins in the project area.

		Campers are more likely to use the river during warmer, lower flow months.
<u>Skill Level</u>	Moderate – High	The ease of access to the project site from campgrounds and cabins make it more likely that those with little river experience will be in the river in the project area.
<u>Access</u>	High	Chiwawa River Road crosses the river in the project area, and numerous secondary roads provide access and parking areas to access the Chiwawa. The project area is a common put in for boating and site for other recreational river access.
<u>Child Presence</u>	High	Established and dispersed campgrounds, and several cabins located on leased USFS lands border the Chiwawa River for much of the project area. Families with children are anticipated to be present in much of the project area during the warmer months, and some LWS are sited in areas that could be accessed via campgrounds and cabins.

2.1.2. Property Damage Risk

Property damage risks pertain to the risks to in-stream and floodplain structures and property due to changes in channel behavior caused by the installation of LWS or LWM within a project area (Knutson et al., 2014). The property damage risk evaluation matrix weighs the characteristics of the channel and its dynamism (generalized for the entire project area in this analysis) versus the land use and development characteristics of the active valley bottom through which the channel flow to place bounds on the overall risk of proposed LWS to built and unbuilt property in the project area. Figure 2 shows the results of the property damage risk analysis performed for LWS proposed in the project area. Table 3 and Table 4 document the rationale used to inform scoring of the property damage risk matrix.

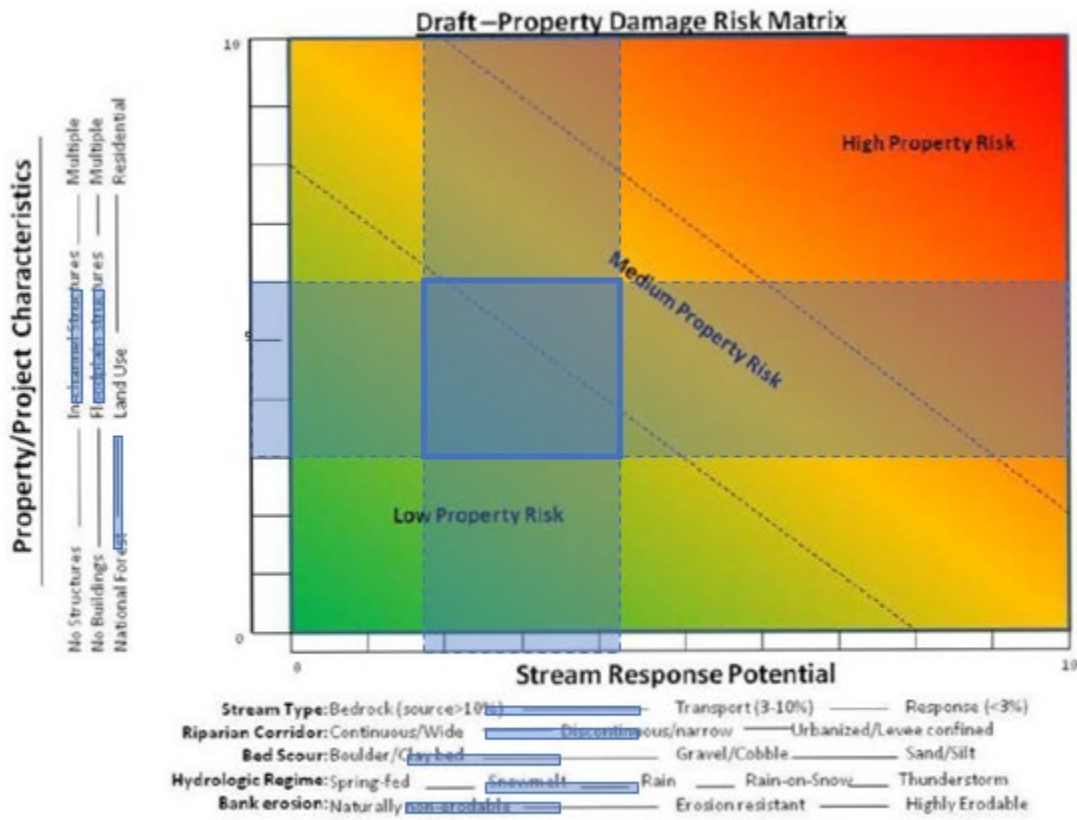


Figure 2: Property damage risk matrix annotated with project-specific scoring for LWS proposed in Chiwawa Area D.

The assessment of stream response potential risk (x-axis) rates the project area low for risk to property. The channel is not particularly dynamic, with non-deformable boundaries in many locations, and is unlikely to erode substantial volumes from the bed or banks. Table 3 provides details about assessed stream response potential risk rating and the justification for each rating factor. The assessment of property/project characteristics (y-axis) yields a low-risk rating. All land within and adjacent to the project reach is USFS property, with relatively little in-channel infrastructure (Chiwawa River Rd. bridge is upstream of most LWS and has no piers in the channel) or high-value structures in the active valley bottom. Table 4 provides details about assessed property risk rating and the justification for each rating factor.

Table 3: Overview of stream response potential for evaluating property damage risk.

<u>Stream Response Potential Factors</u>	<u>Risk</u>	<u>Justification</u>
<u>Stream Type</u>	Low - Moderate	The channel is a transport channel, but it is bounded by bedrock and/or glacial landforms which are resistant to erosion. The channel morphology reduces the streams' ability to respond.
<u>Riparian Corridor</u>	Low - Moderate	The active valley bottom in the project area is relatively narrow, yet channel migration is unlikely in most locations due to the morphology of the valley, and in places where this could occur, channel migration is not anticipated to cause serious harm.
<u>Bed Scour Potential</u>	Low	The bed in the project area primarily flows over bedrock or coarse glacial deposits, which are likely immobile at all but the most extreme peak flows.
<u>Bank Erosion Potential</u>	Low	Banks in the project area primarily consist of bedrock, coarse glacial sediments, or coarse glaciofluvial deposits. Banks generally are supported by dense root networks and erode slowly.
<u>Dominant Hydrologic Regime</u>	Low – Moderate	The hydrology of the Chiwawa River is snowmelt-driven, but occasional large floods have been associated with late-fall rainfall or rain-on-snow events.

Table 4: Overview of property/project characteristics for evaluating property damage risk.

<u>Property / Project Characteristics Factor</u>	<u>Risk</u>	<u>Justification</u>
<u>In-Channel Structures</u>	Moderate	The Chiwawa River Road bridge is located at the upstream side of the project area, but almost all LWS are located downstream of the bridge. No in-channel structures are located for several river miles downstream of the project area.
<u>Floodplain Structures</u>	Moderate	Leased cabins and minor campground infrastructure are the only floodplain structures in the project area. A few of the leased cabins are situated within or adjacent to the modeled 100-year floodplain under existing conditions.
<u>Land Use</u>	Low	The project area is entirely located on USFS land.

2.2. EVALUATION OF WOOD STRUCTURE RISK AND STABILITY

Based on the above analysis, the project has a high public safety risk and a moderate property damage risk, based on the bulk of each risk envelope falling within these categories. Therefore, the LWS in the project area are recommended to be designed for stability up to a 50-year flood (Knutson et al., 2014). Table 5 provides a summary of risk assessment findings, recommended stability criteria, and minimum target FOS values for wood mobility based on risk assessment findings.

Table 5: Chiwawa Area D large wood structure risk assessment results and recommended stability characteristics.

Public Safety Risk	Property Damage Risk	Stability Design Flow Criteria	Net Horizontal (FOS _{sliding})	Net Vertical (FOS _{buoyancy})
High	Moderate	50-year	1.5	1.75

Note: Values are from Table 4 p. 47 (Knutson et. al. 2014). FOS rotation and FOS overturning are not reported as they are not critical to the project LWS types.

3. DESIGN APPROACH

3.1. GEOMORPHIC AND HABITAT FUNCTIONS

The locations of LWS, as well as individual pieces of large wood material within the structures, have been chosen to provide particular geomorphic and habitat functions. LWS placed along the channel margins are intended to induce pool scour, provide cover, and add roughness; these effects are anticipated to enhance holding and rearing habitats. LWS placed at the apex of bars function to split or deflect flows, sort and store sediment, and trap mobile wood; these effects are intended to boost the geomorphic processes which drive habitat creation in the channel rather than to provide point habitat, though they may evolve to do so over time. Whole trees incorporated within structures or located separately are designed to mimic the redirection of flow and hydraulic complexity that typically occurs when a large fallen tree is present along the channel margins or on the floodplain.

3.2. STABILIZATION METHODS

Stabilization for LWS will be provided by a combination of:

- ▶ Native backfill, where the LWM are partially buried and the weight of the overlying soil provides vertical resistance to buoyant forces and passive soil forces to resist sliding.
- ▶ Timber Piles (vertical snags), where the horizontal LWM are mechanically connected to the timber piles transferring vertical and horizontal forces.
- ▶ Self-Ballasted, where the weight of LWM above the design target WSE provides sufficient resistance to vertical and horizontal forces.

Additionally, project construction documents require timber pile installation pull-out resistance tests to be performed during construction. These tests will help validate design timber pile capacity assumptions and provide information needed for field engineering, should it be needed. These services will help ensure that the minimum design factors of safety are met for all the LWS as they are constructed.

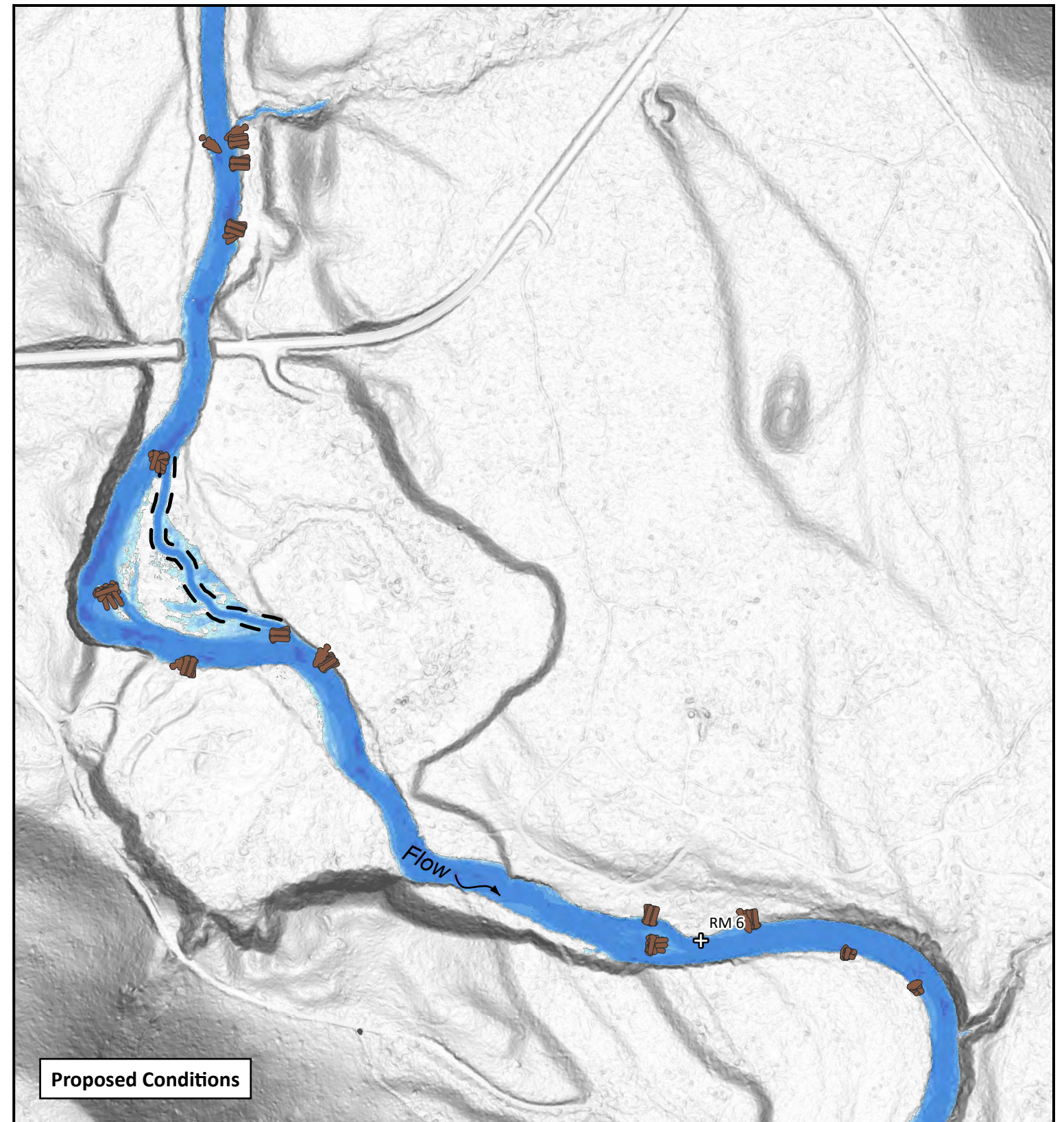
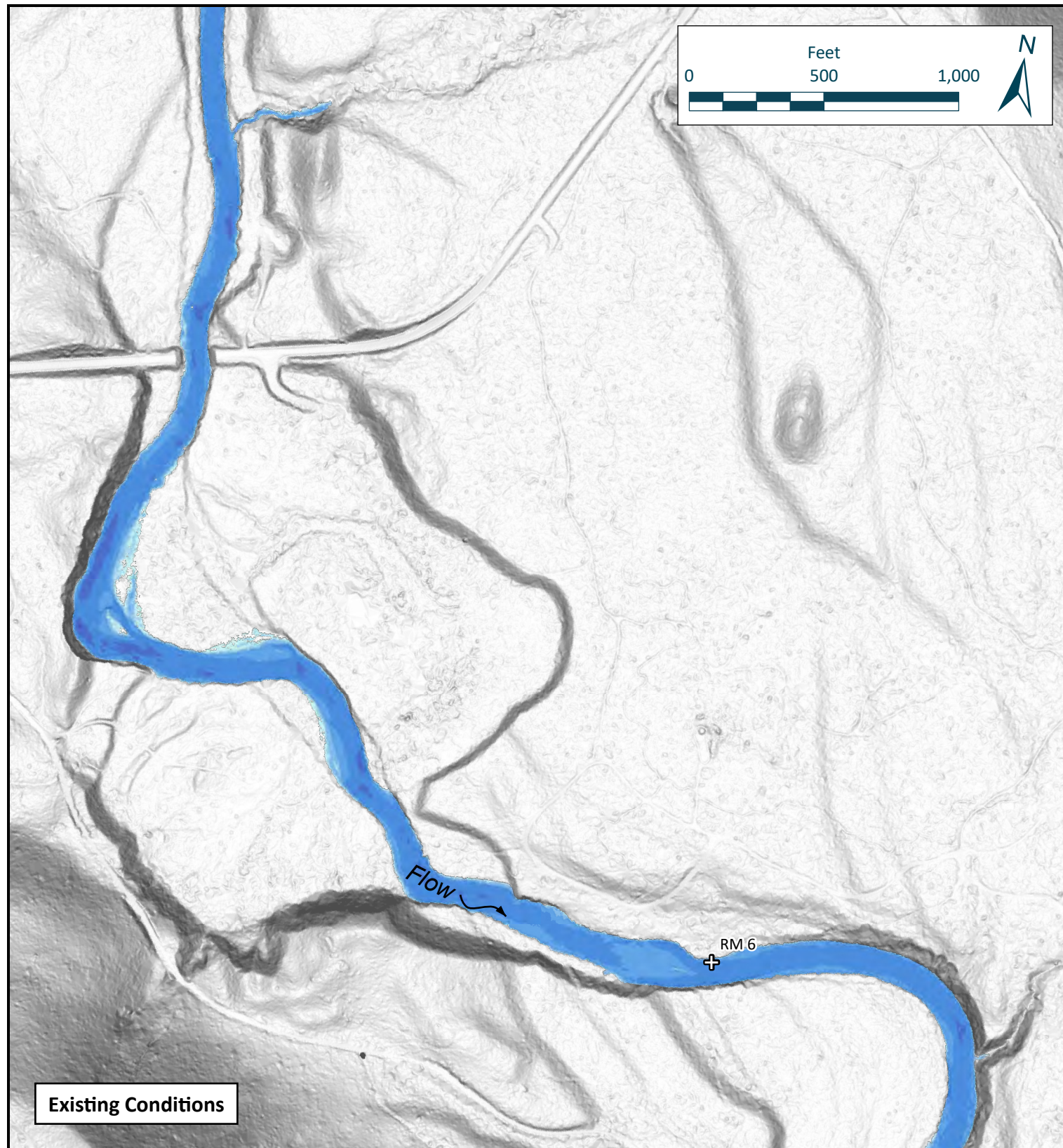
3.3. CALCULATIONS

In future design phases, calculations will follow the procedures and formulas provided in the USBR's Large Wood Material Risk Based Design Guidelines (Knutson et al., 2014). Applicable sections included; 6.4.2 Resistance to Flootation and 6.4.3 Resistance to Sliding. Given the configuration of the LWS in the project, resistance to rotation (Section 6.4.4) and resistance to overturning (Section 6.4.5) will not be evaluated. The calculations will be based on the results of the proposed 2D hydraulic modeling results as well as the size and the configurations of each type of LWS.

4. REFERENCES

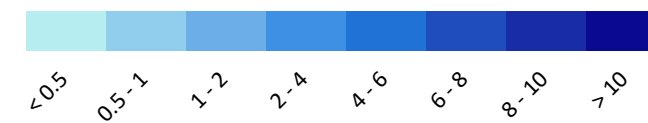
Knutson, M. and Fealko, J. 2014. Large Woody Material - Risk Based Design Guidelines. U.S. Department of the Interior Bureau of Reclamation Pacific Northwest Region & Technical Services. Boise, Idaho. September 2014. <http://www.usbr.gov/pn//fcrps/documents/lwm.pdf>

Appendix D | Hydraulic Modeling Results



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

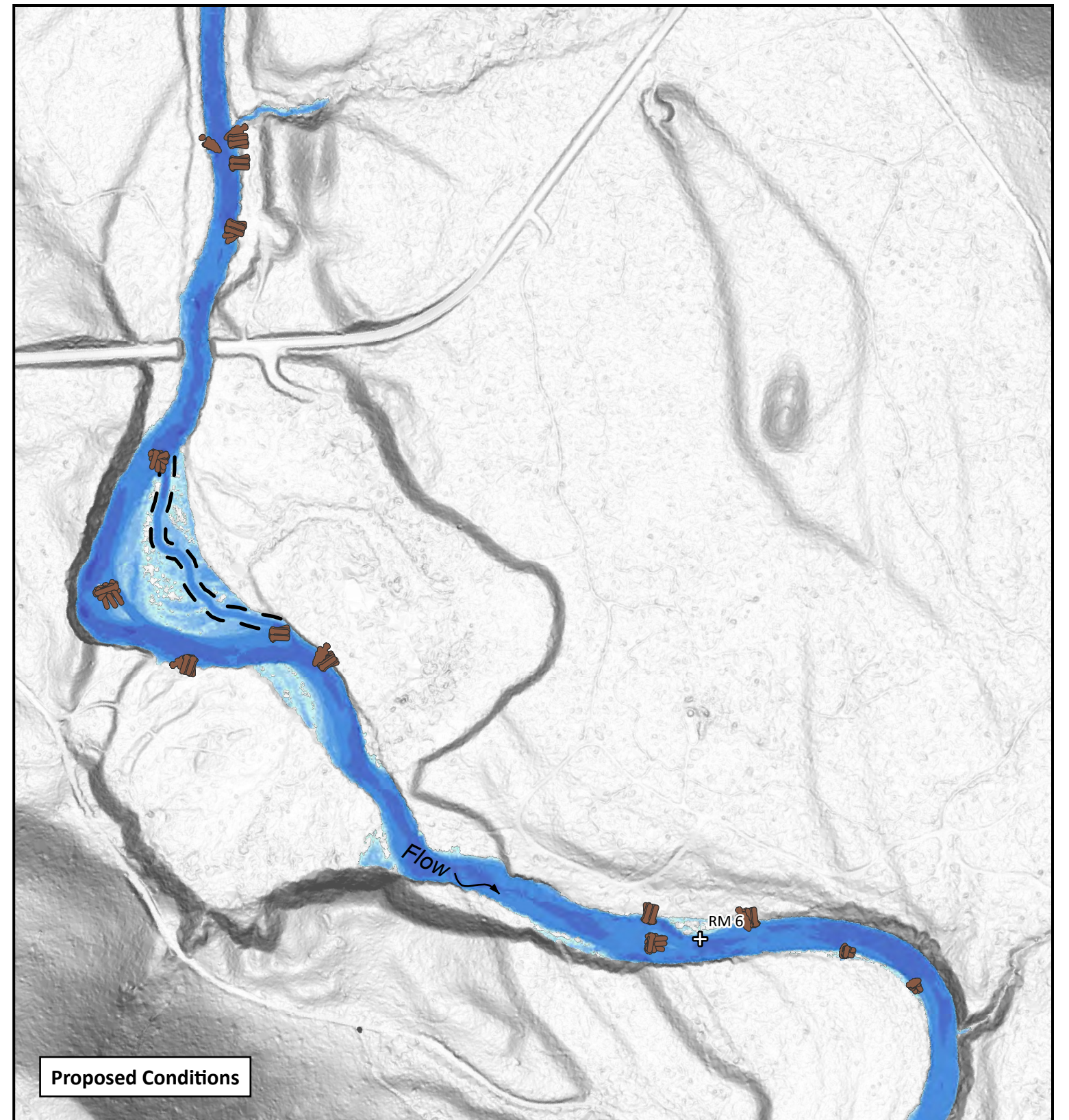
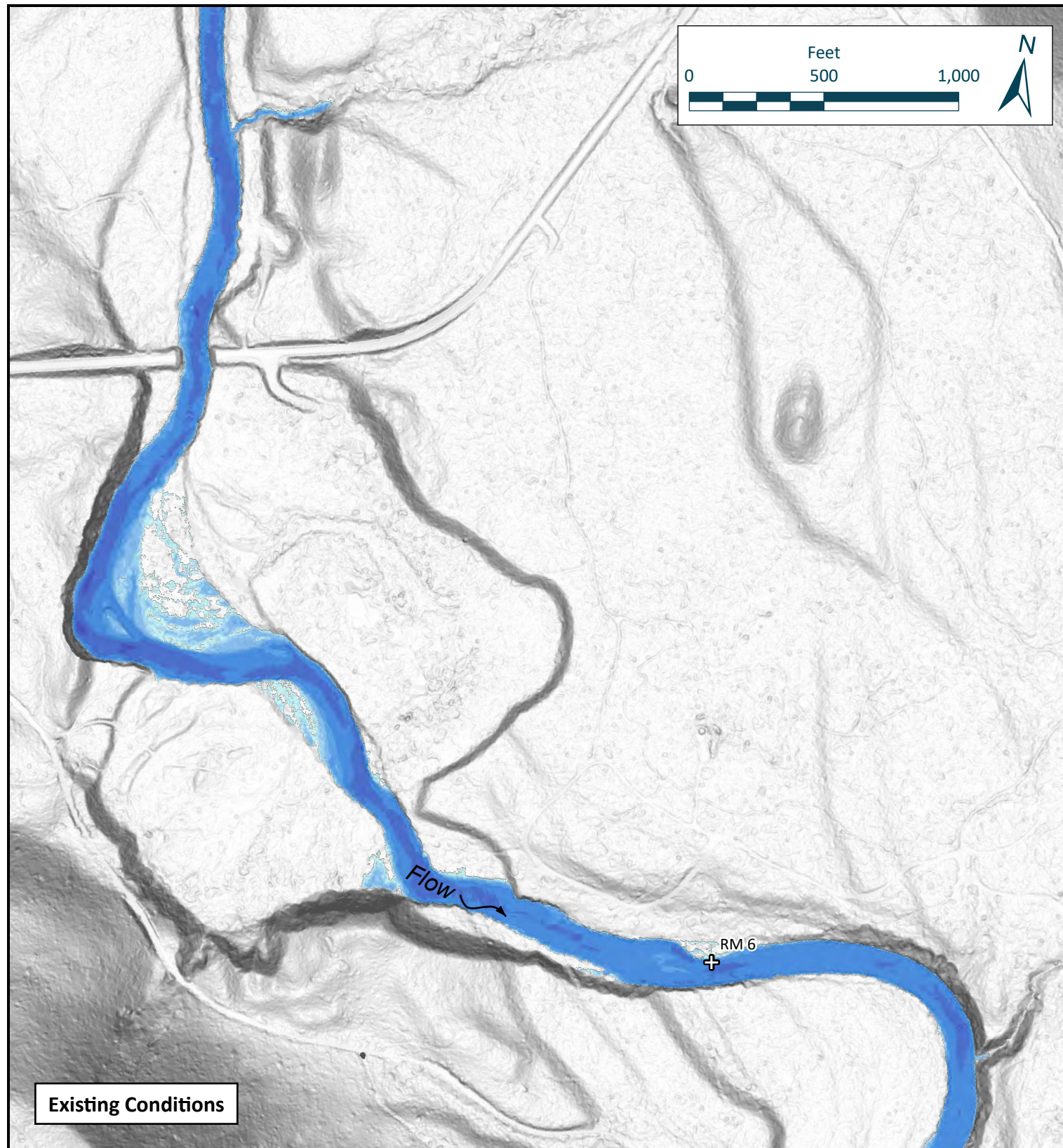
Modeled Depth (ft)



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Depth

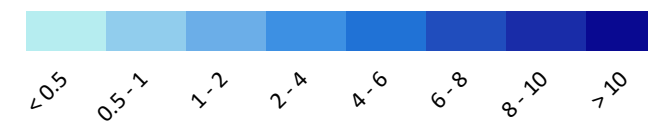
2-Year Return Period Peak Flow:

Modeled Discharge: 3,206 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment

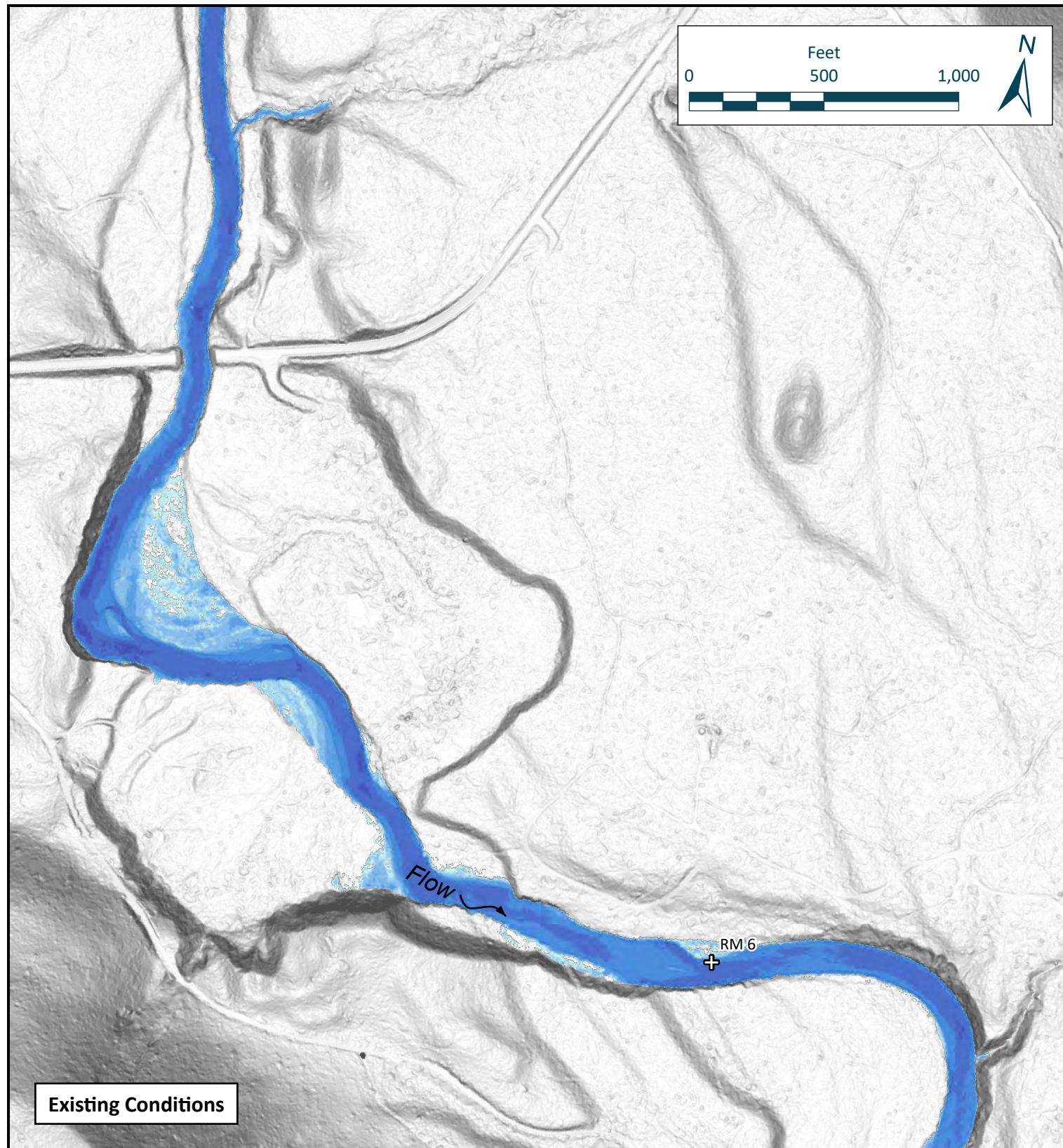
Modeled Depth (ft)



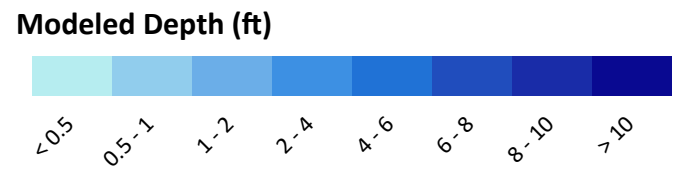
Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Depth

5-Year Return Period Peak Flow:

Modeled Discharge: 4,362 cfs

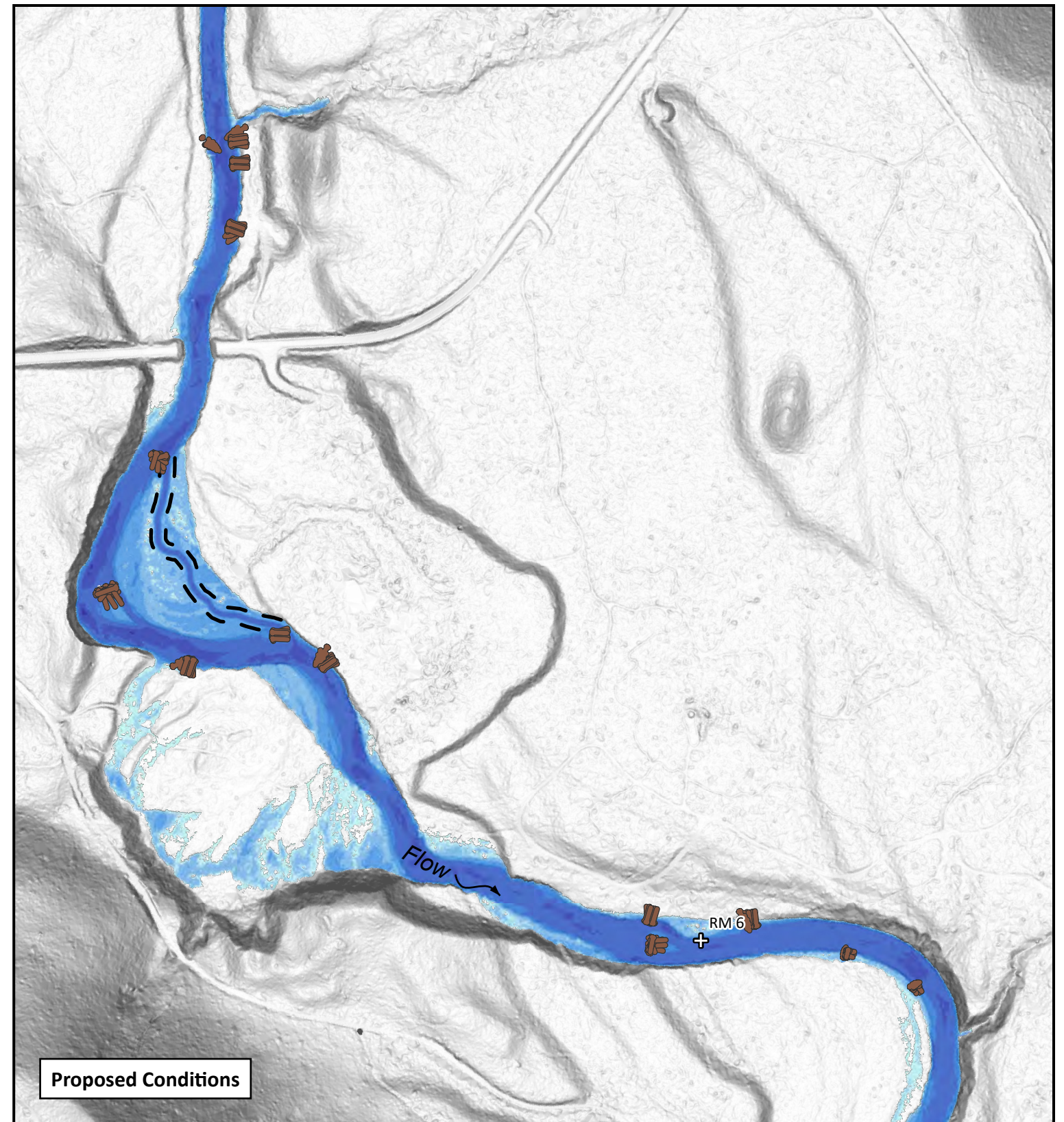
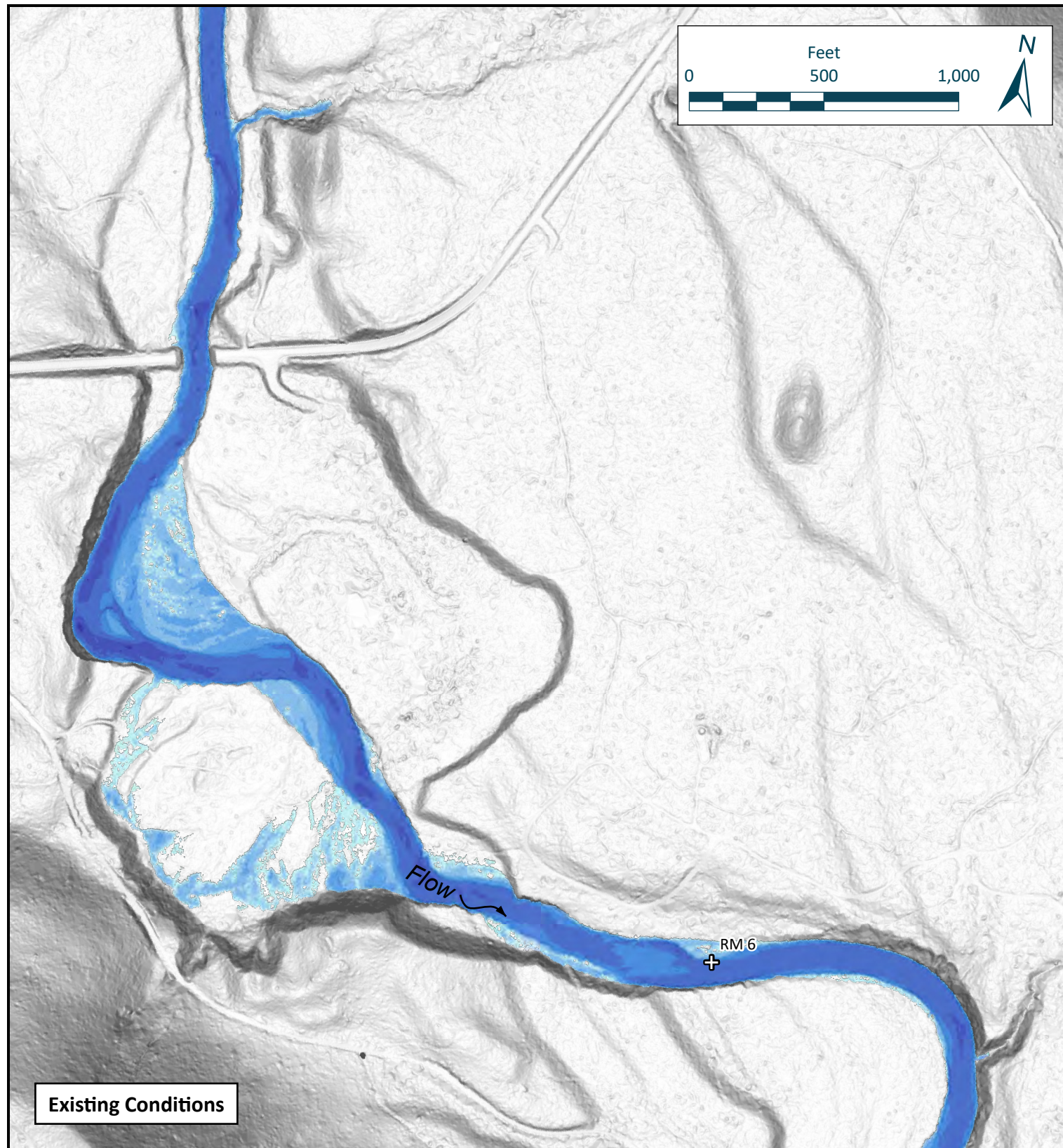


- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment



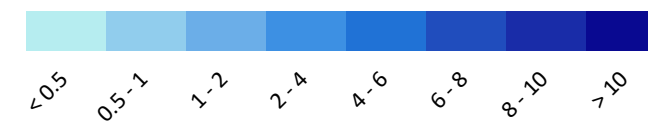
Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Depth

10-Year Return Period Peak Flow:
Modeled Discharge: 5,103 cfs



- ⊕ River Miles
- 🪵 Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment

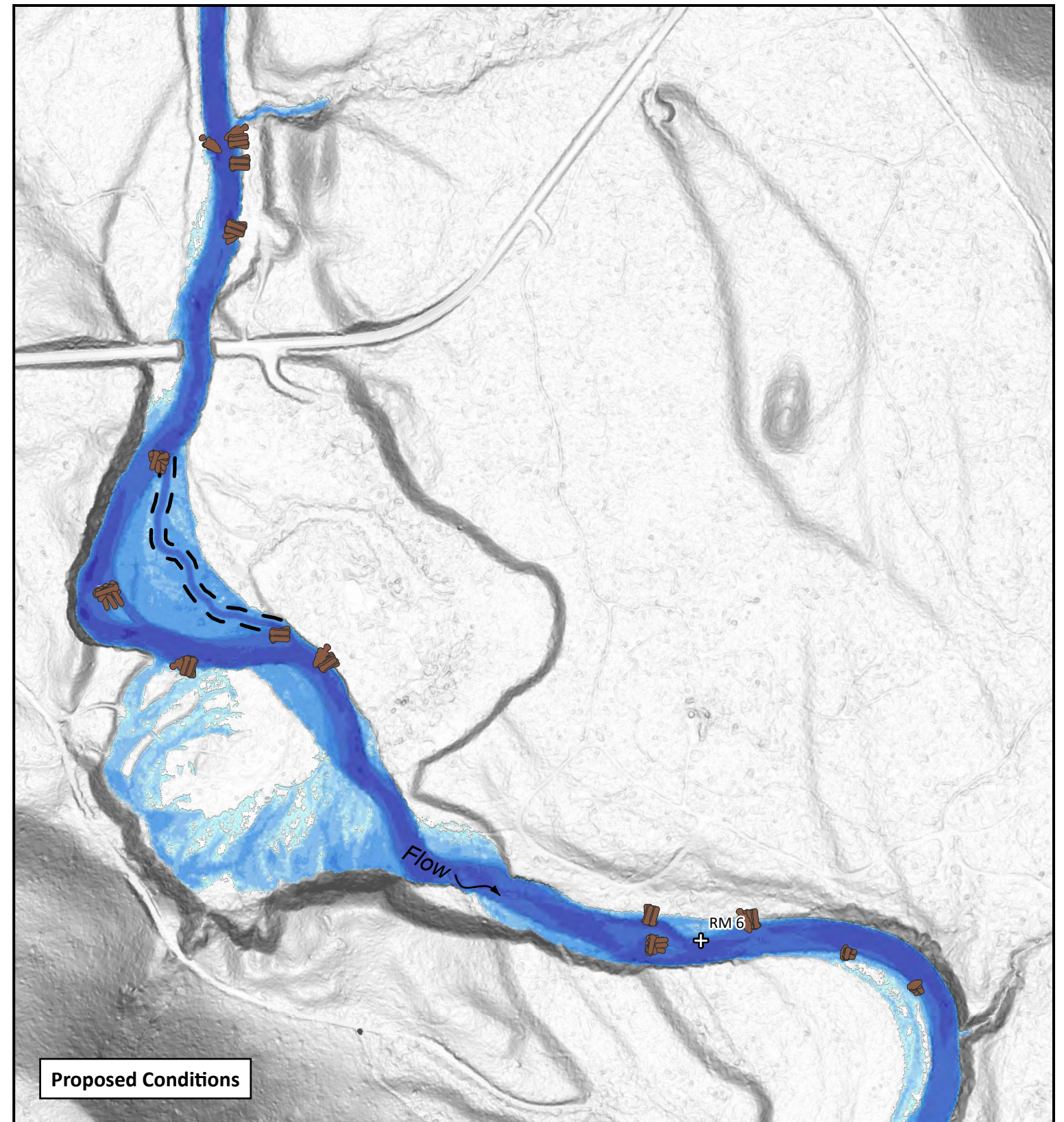
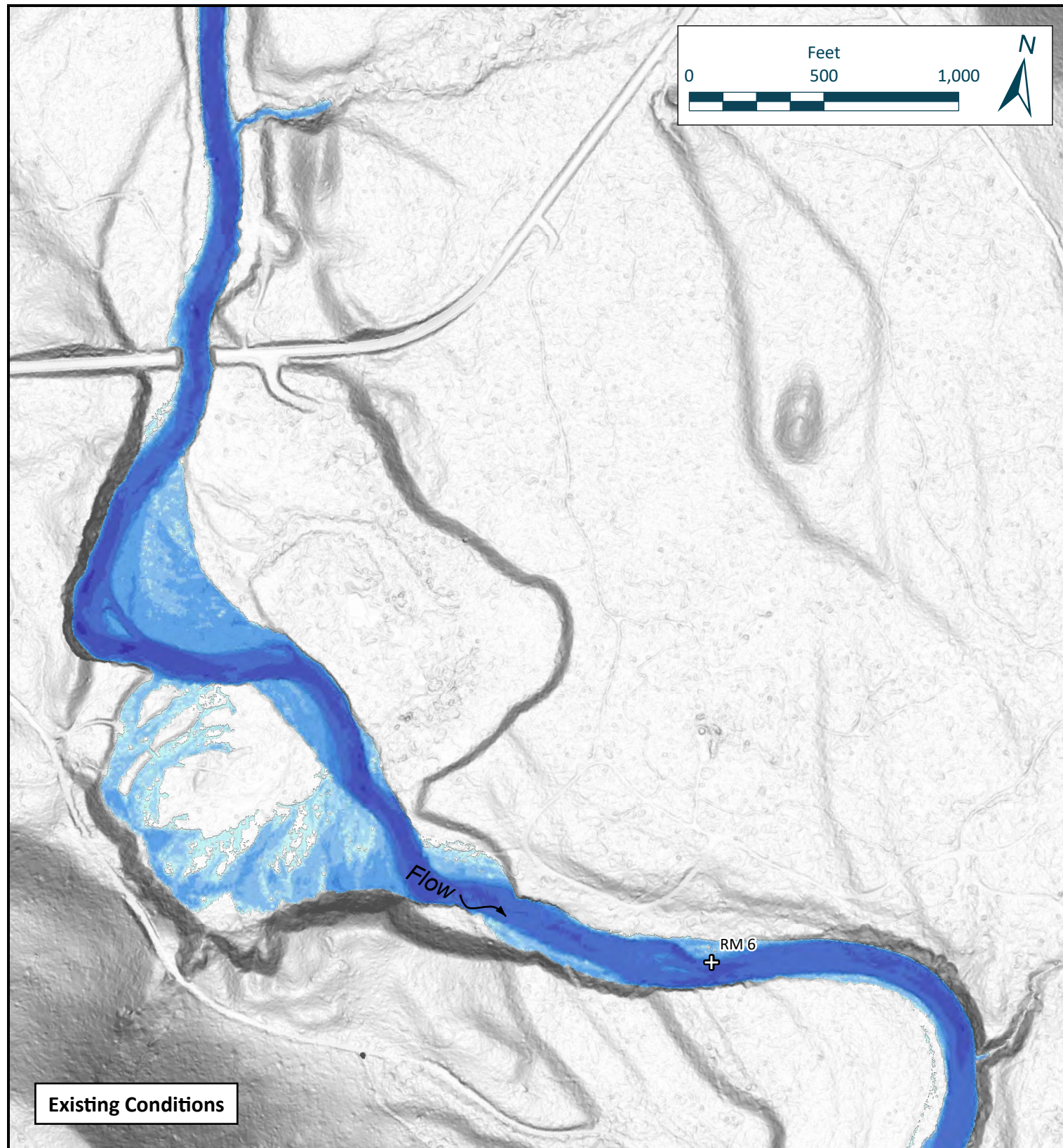
Modeled Depth (ft)



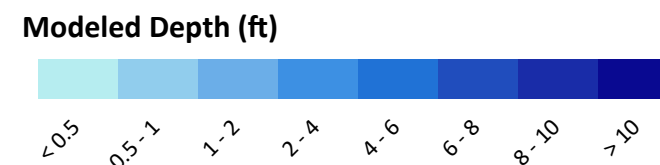
Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Depth

25-Year Return Period Peak Flow:

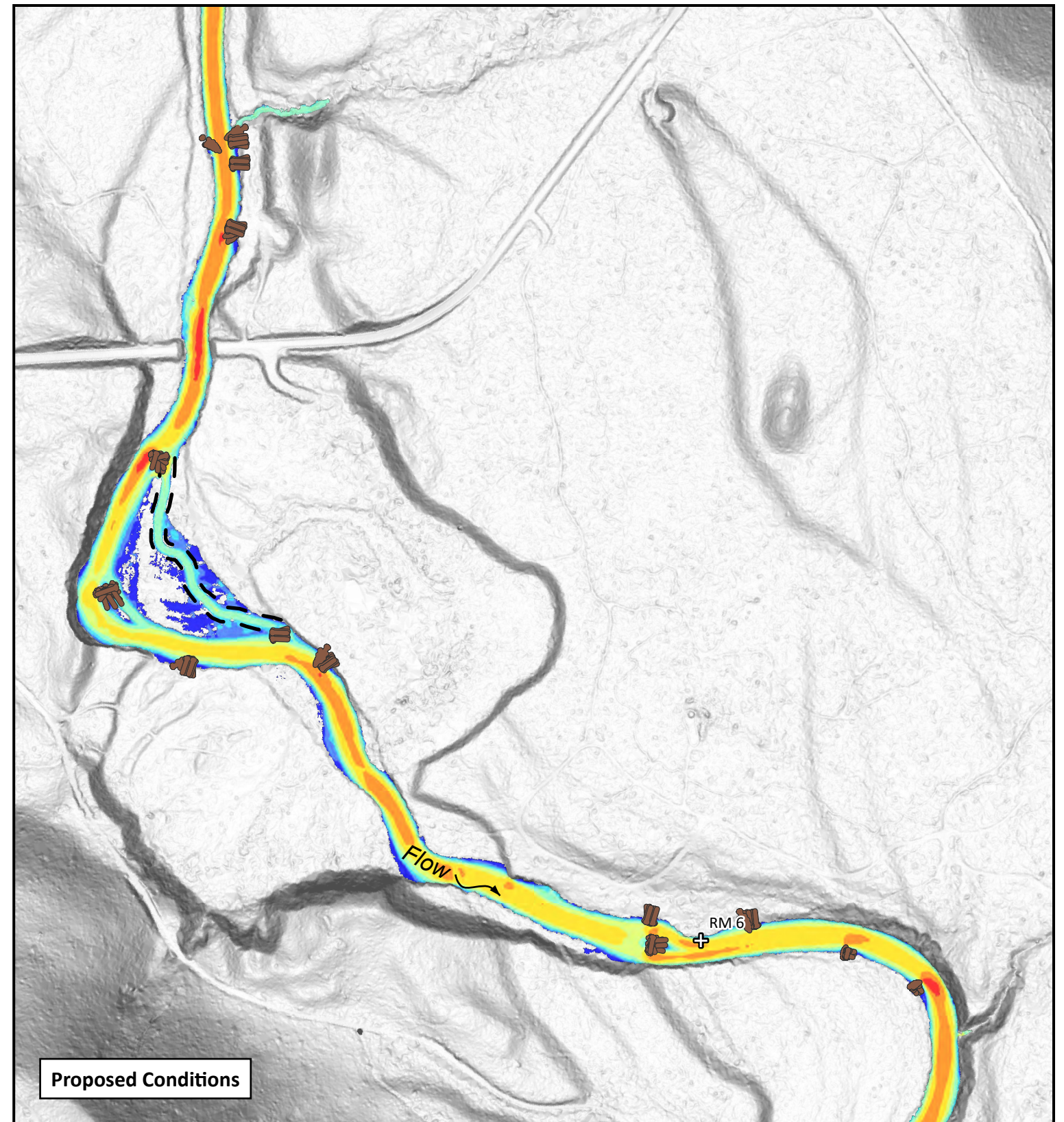
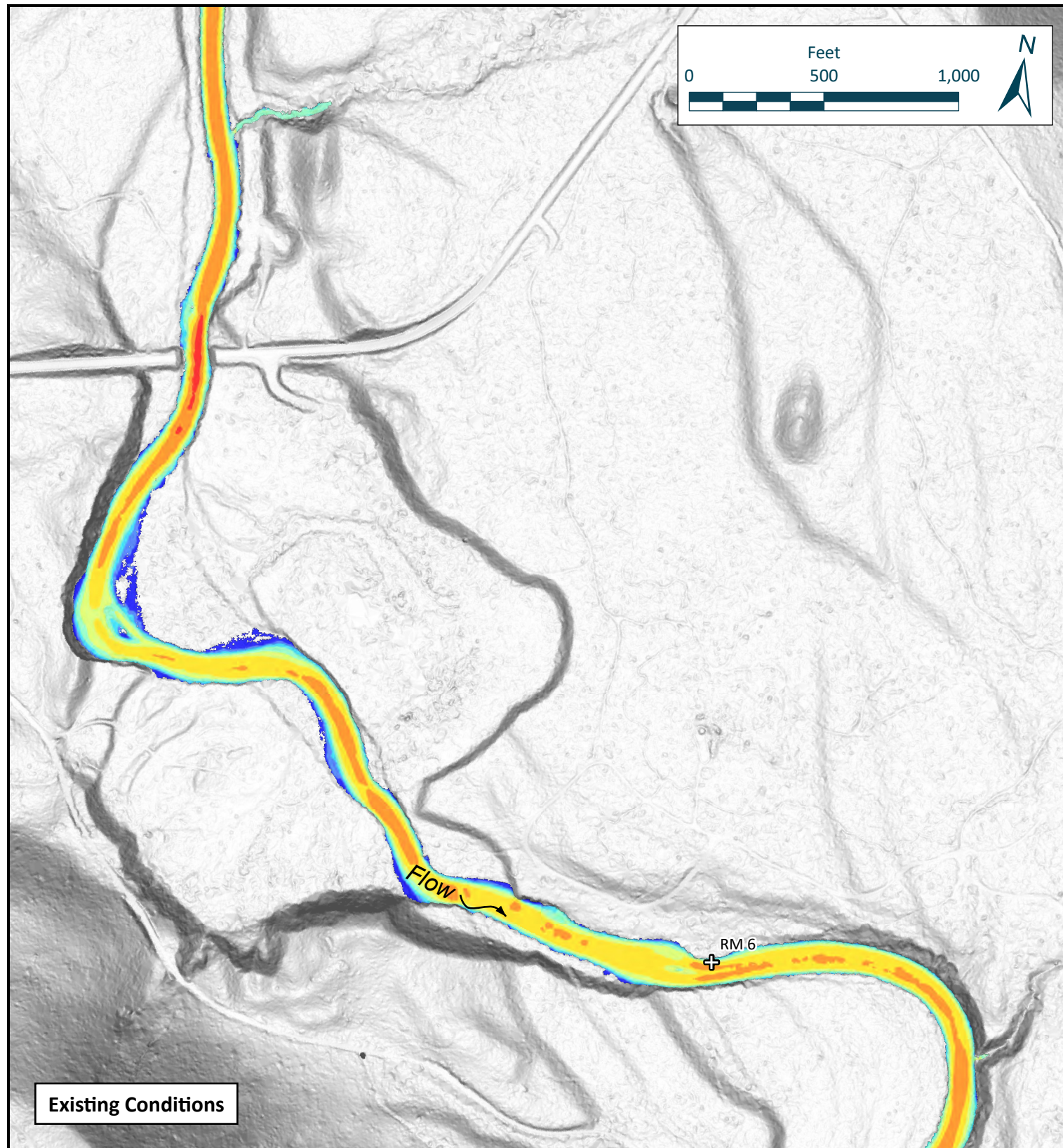
Modeled Discharge: 6,014 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment

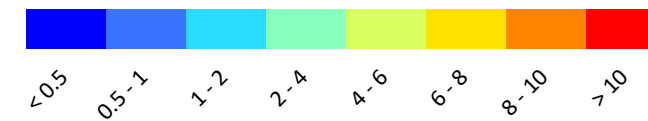


Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Depth
100-Year Return Period Peak Flow:
 Modeled Discharge: 7,328 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment

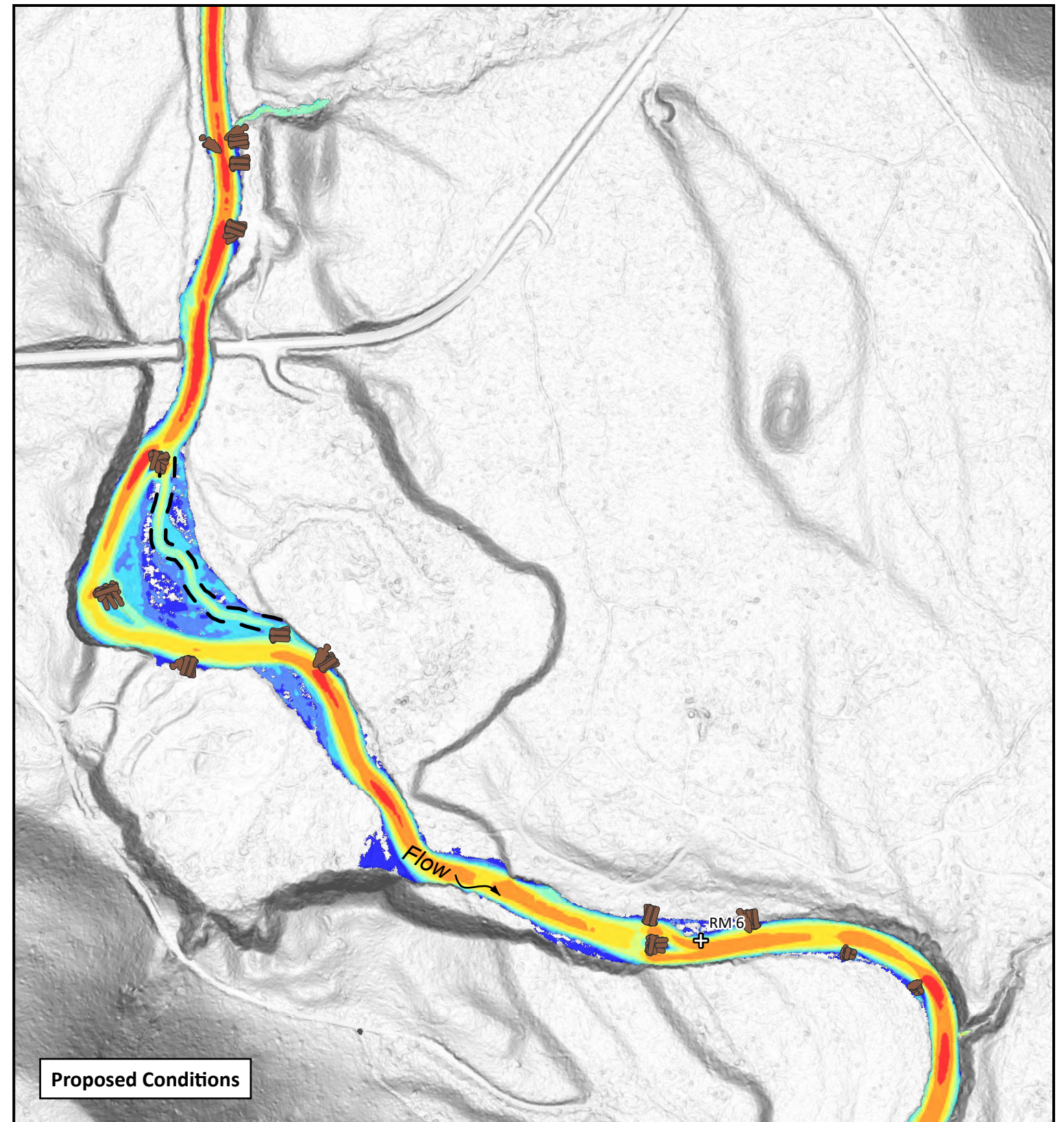
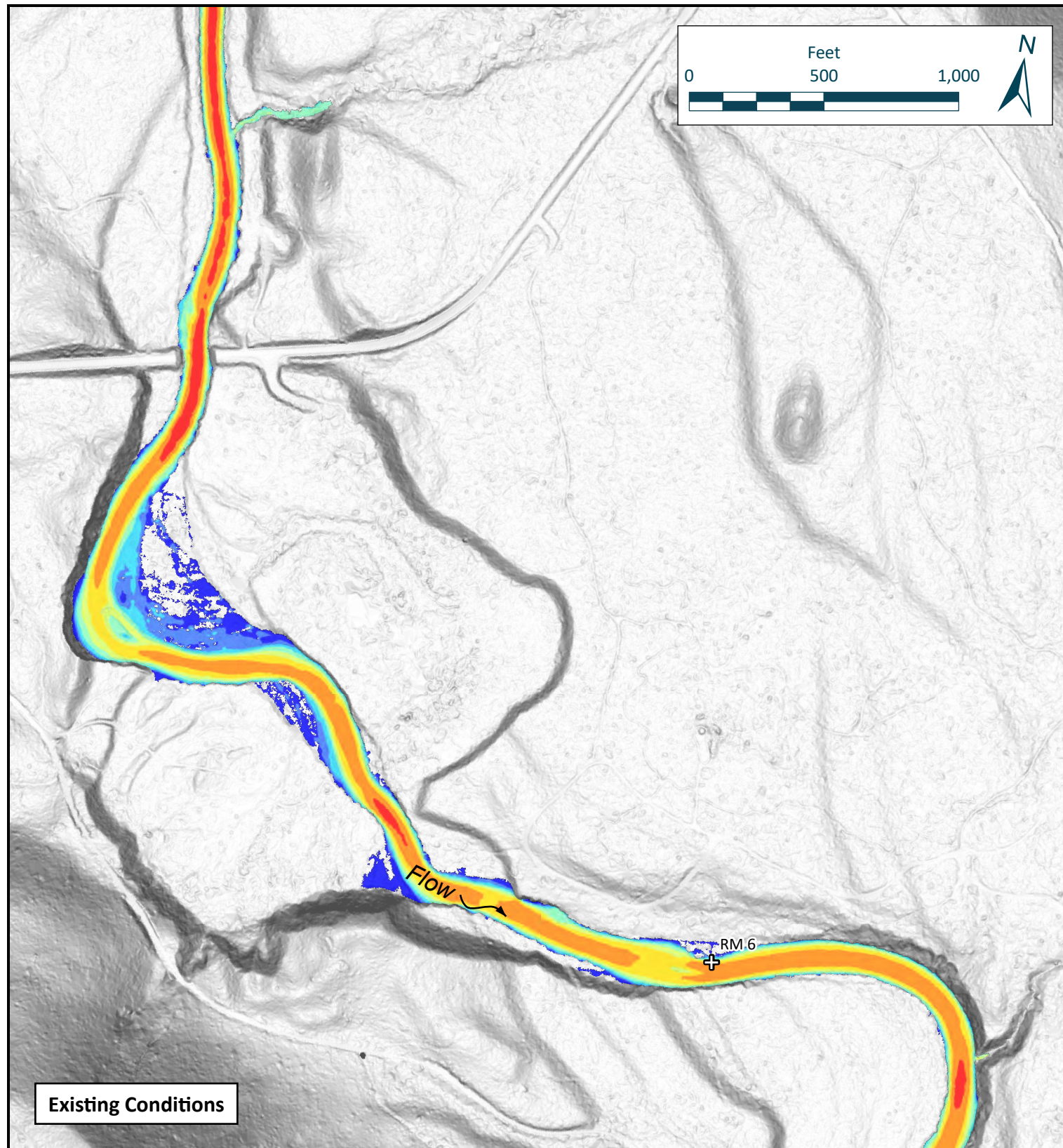
Modeled Velocity (ft/s)



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Velocity

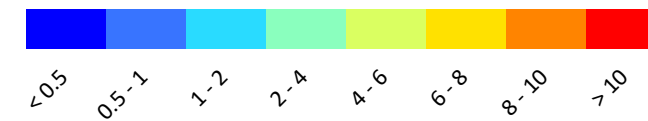
2-Year Return Period Peak Flow:

Modeled Discharge: 3,206 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

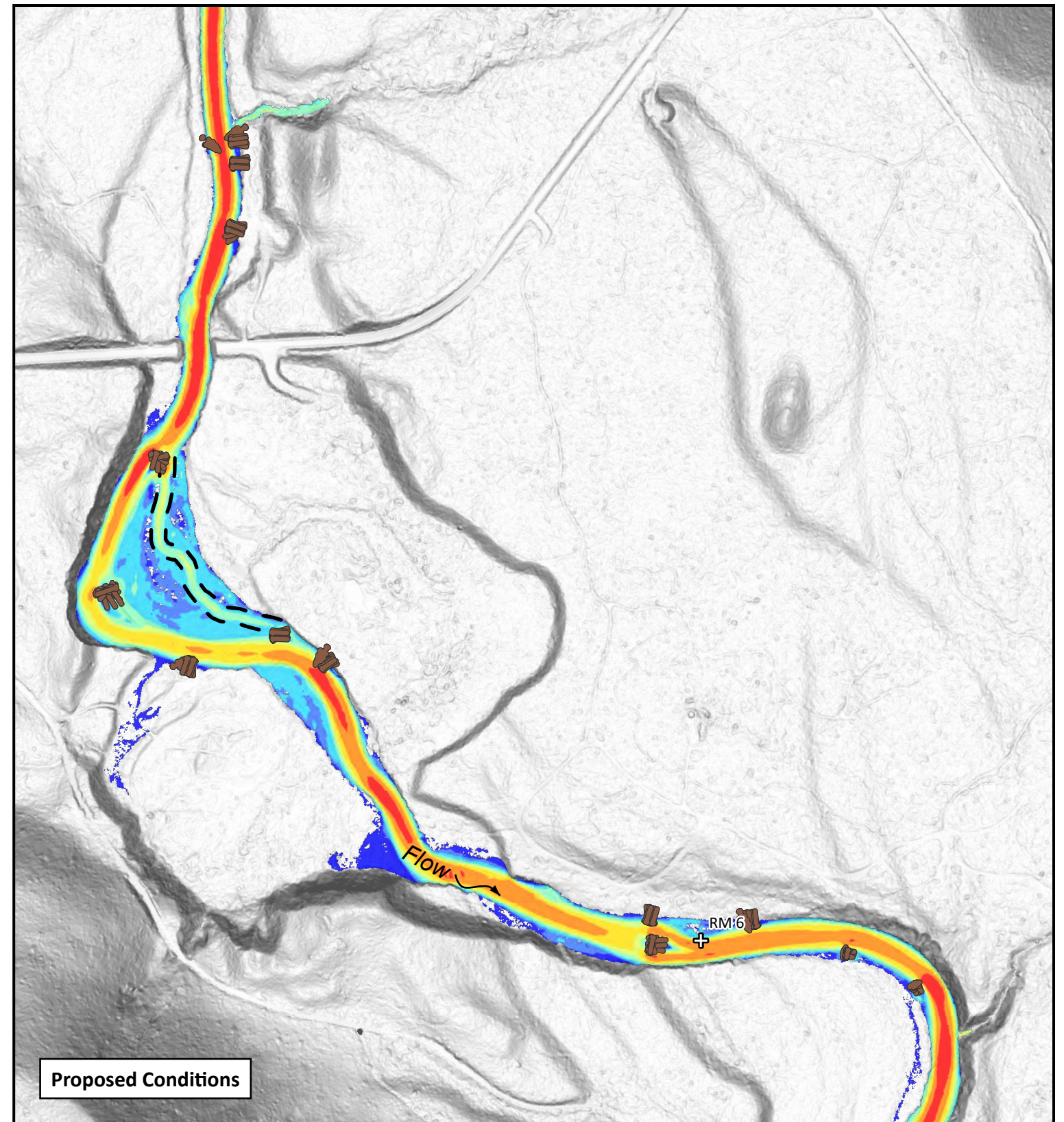
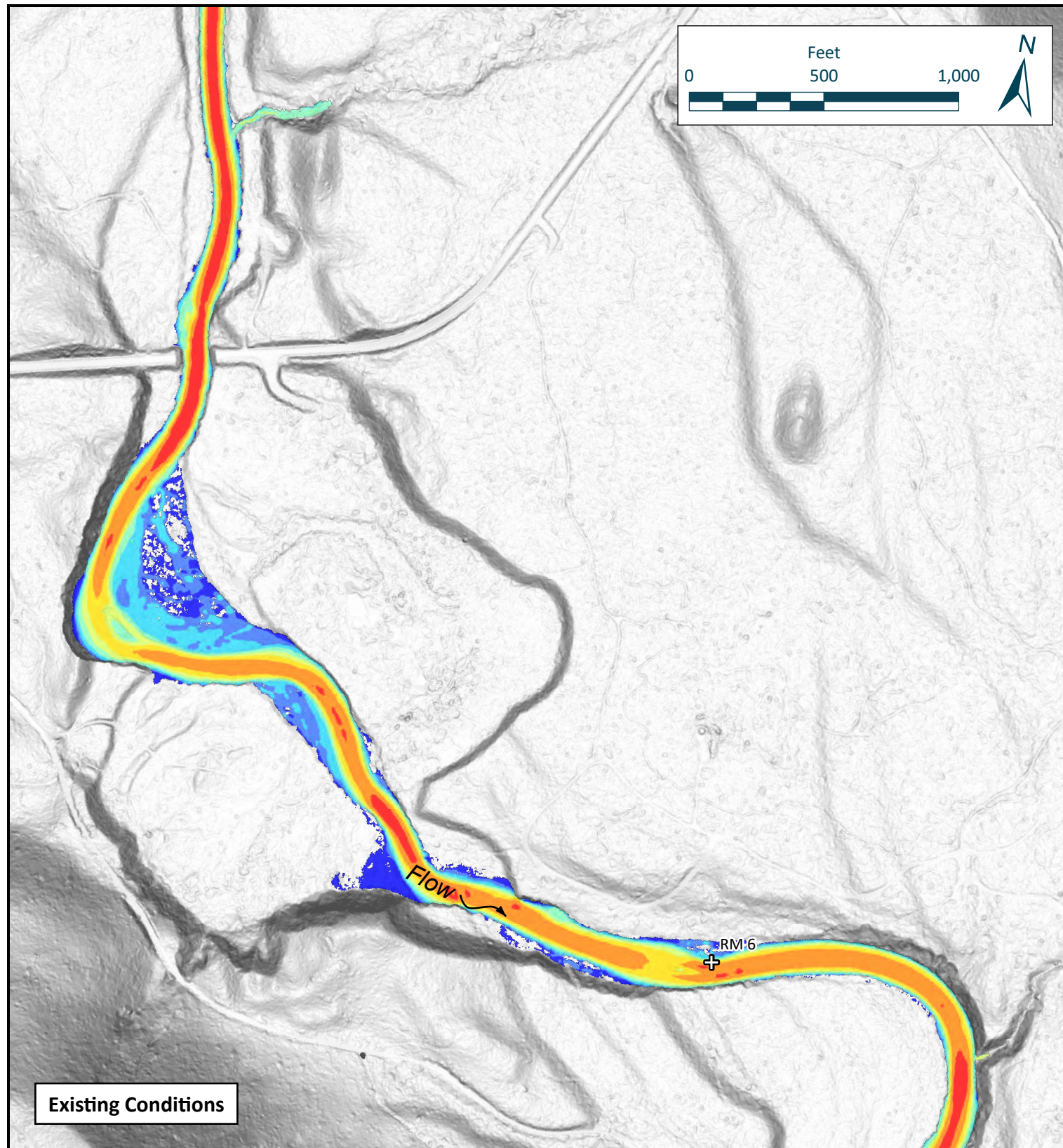
Modeled Velocity (ft/s)



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Velocity

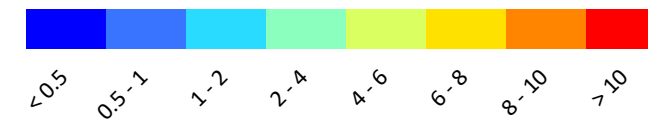
5-Year Return Period Peak Flow:

Modeled Discharge: 4,362 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

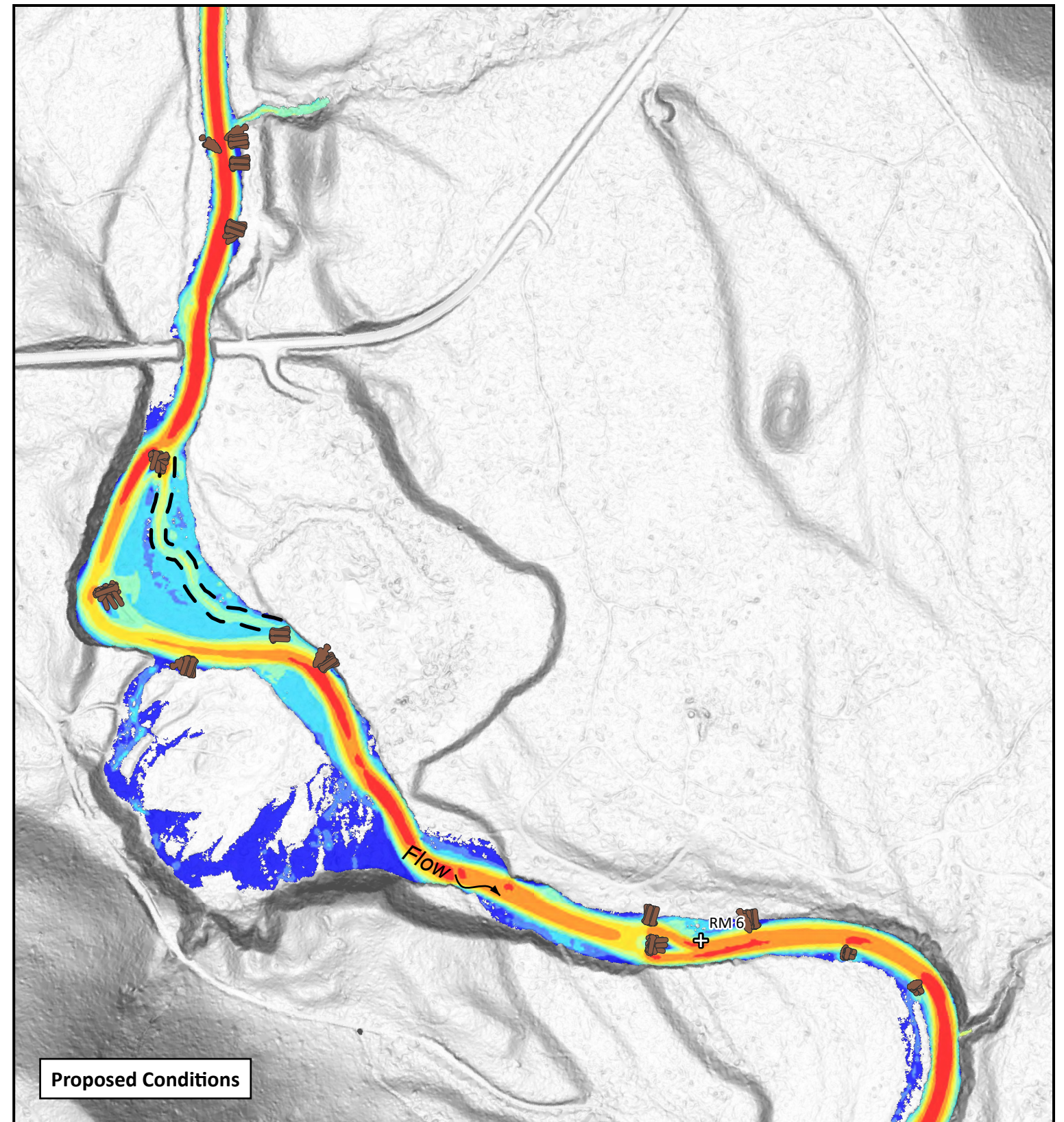
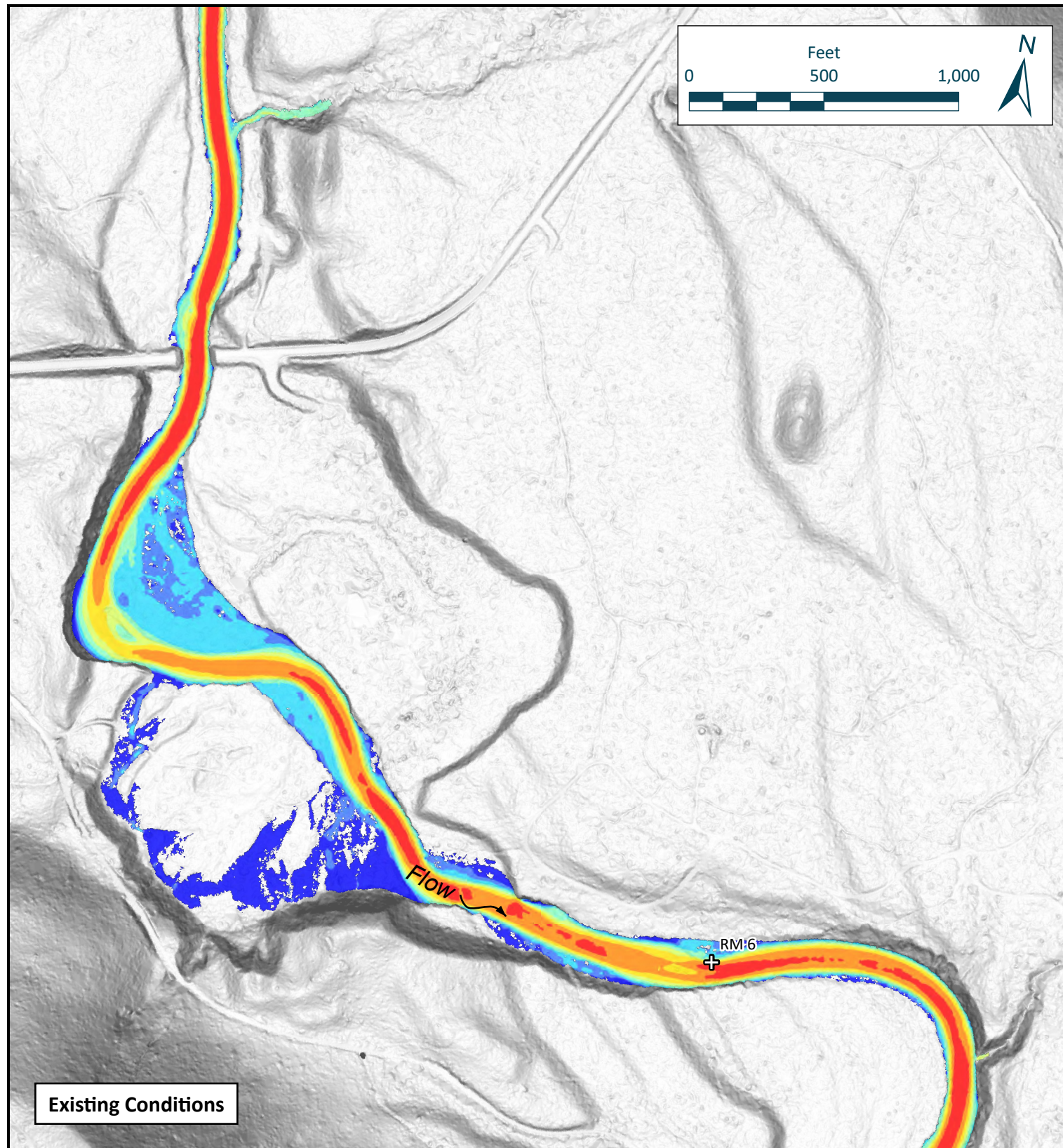
Modeled Velocity (ft/s)



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Velocity

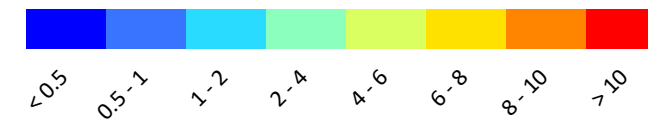
10-Year Return Period Peak Flow:

Modeled Discharge: 5,103 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

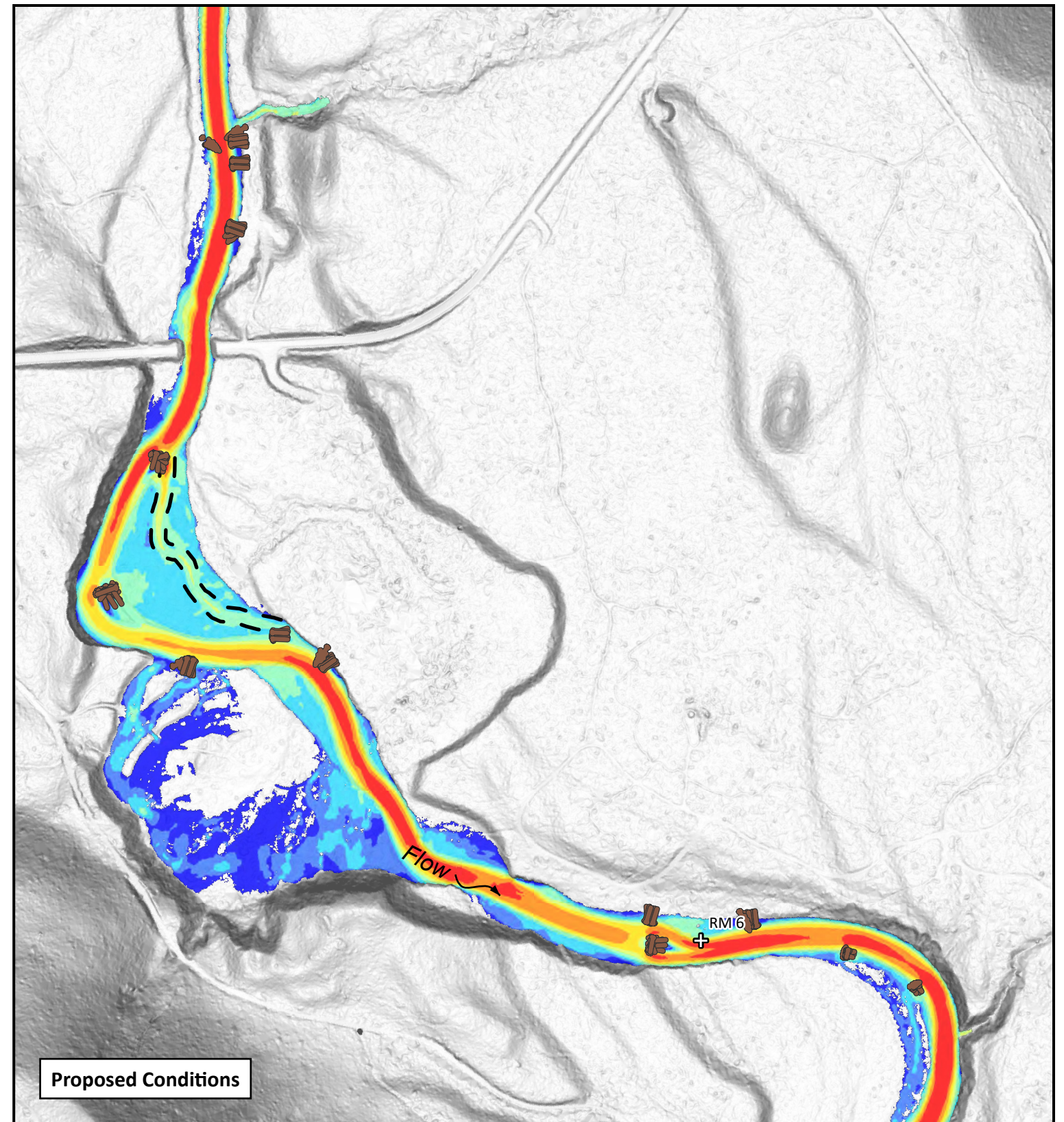
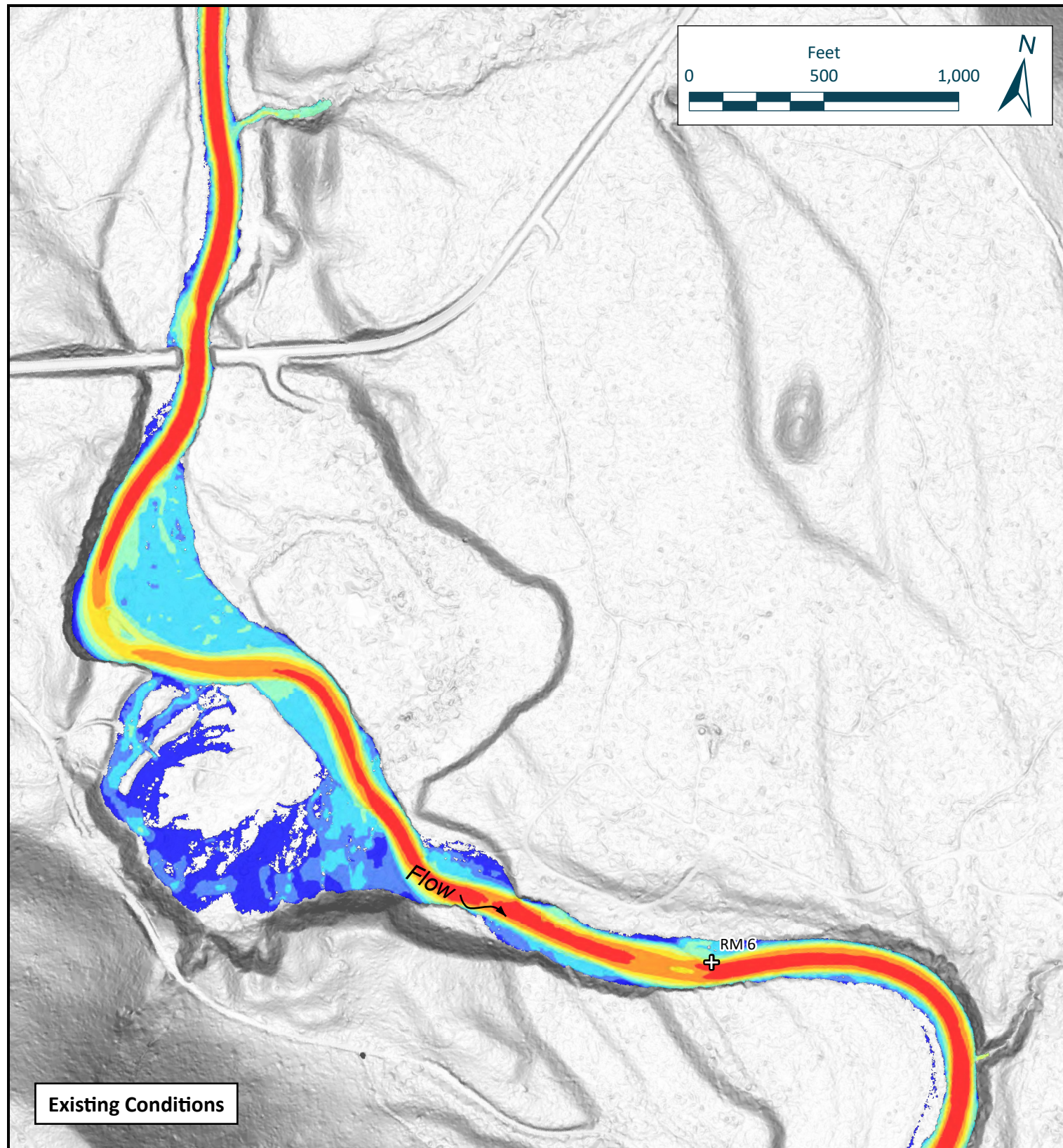
Modeled Velocity (ft/s)



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Velocity

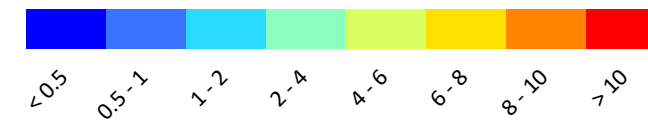
25-Year Return Period Peak Flow:

Modeled Discharge: 6,014 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

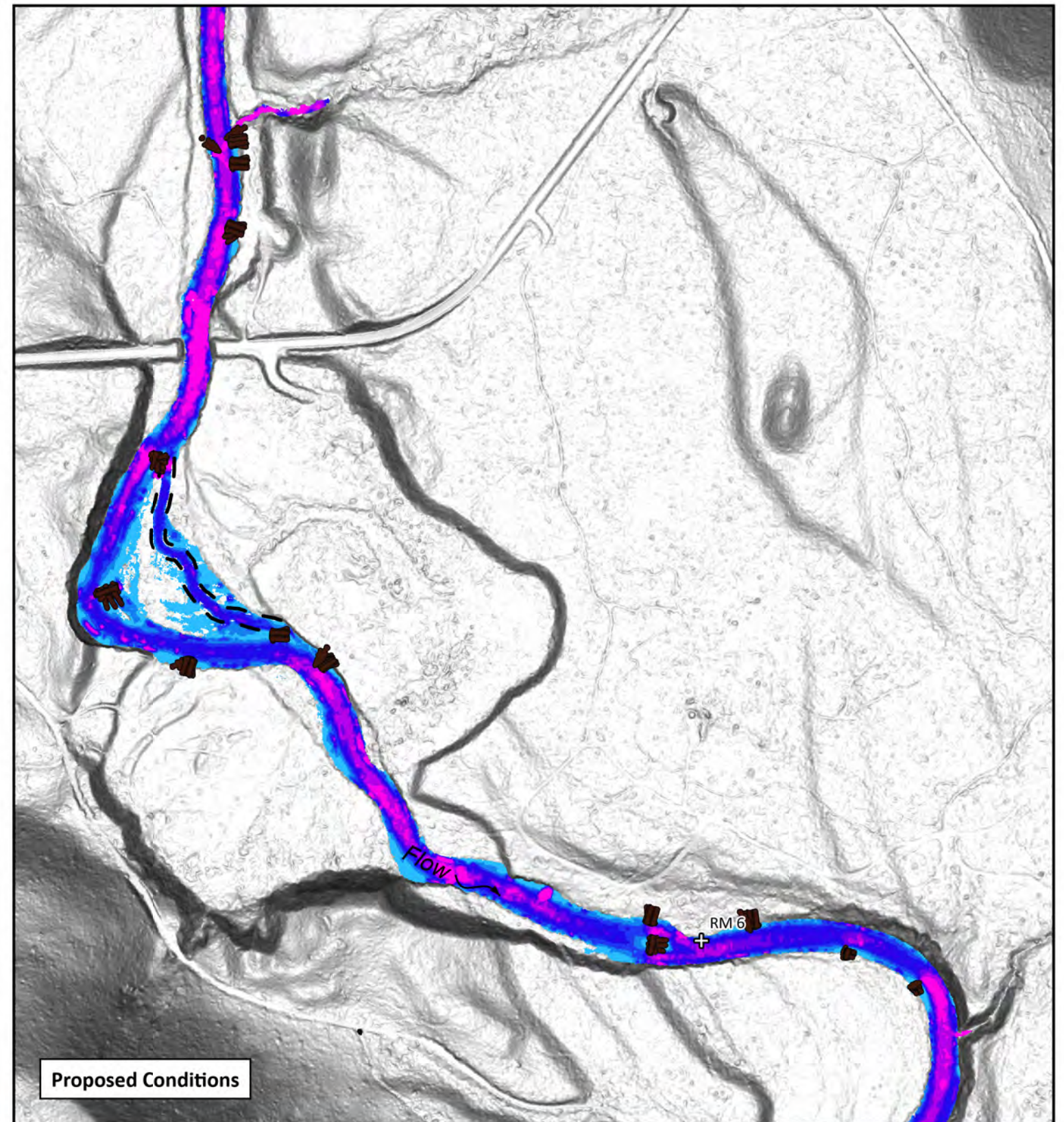
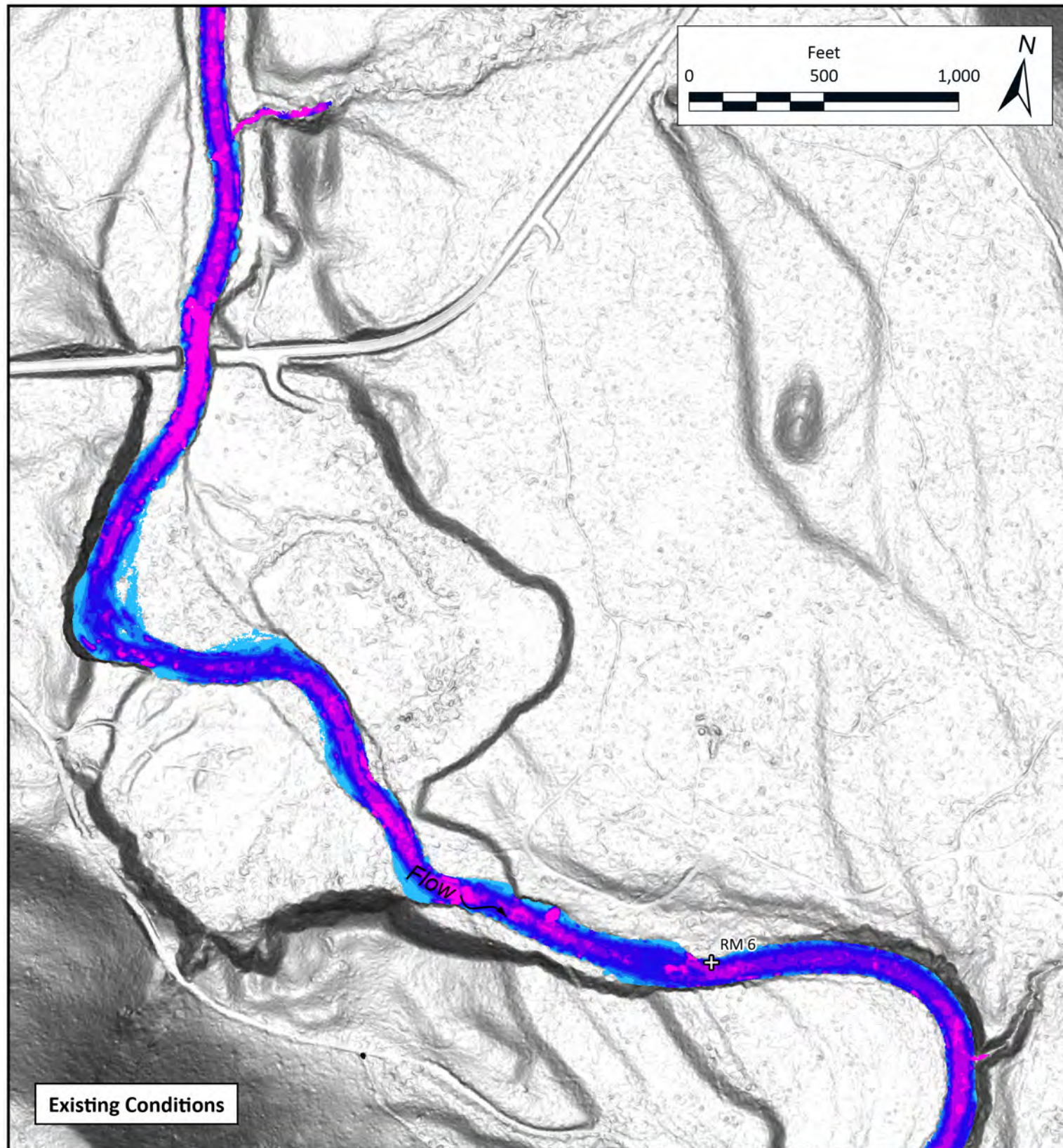
Modeled Velocity (ft/s)



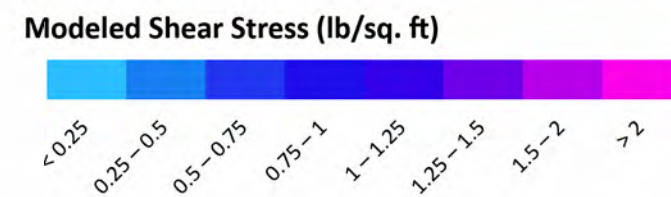
Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Velocity

100-Year Return Period Peak Flow:

Modeled Discharge: 7,328 cfs

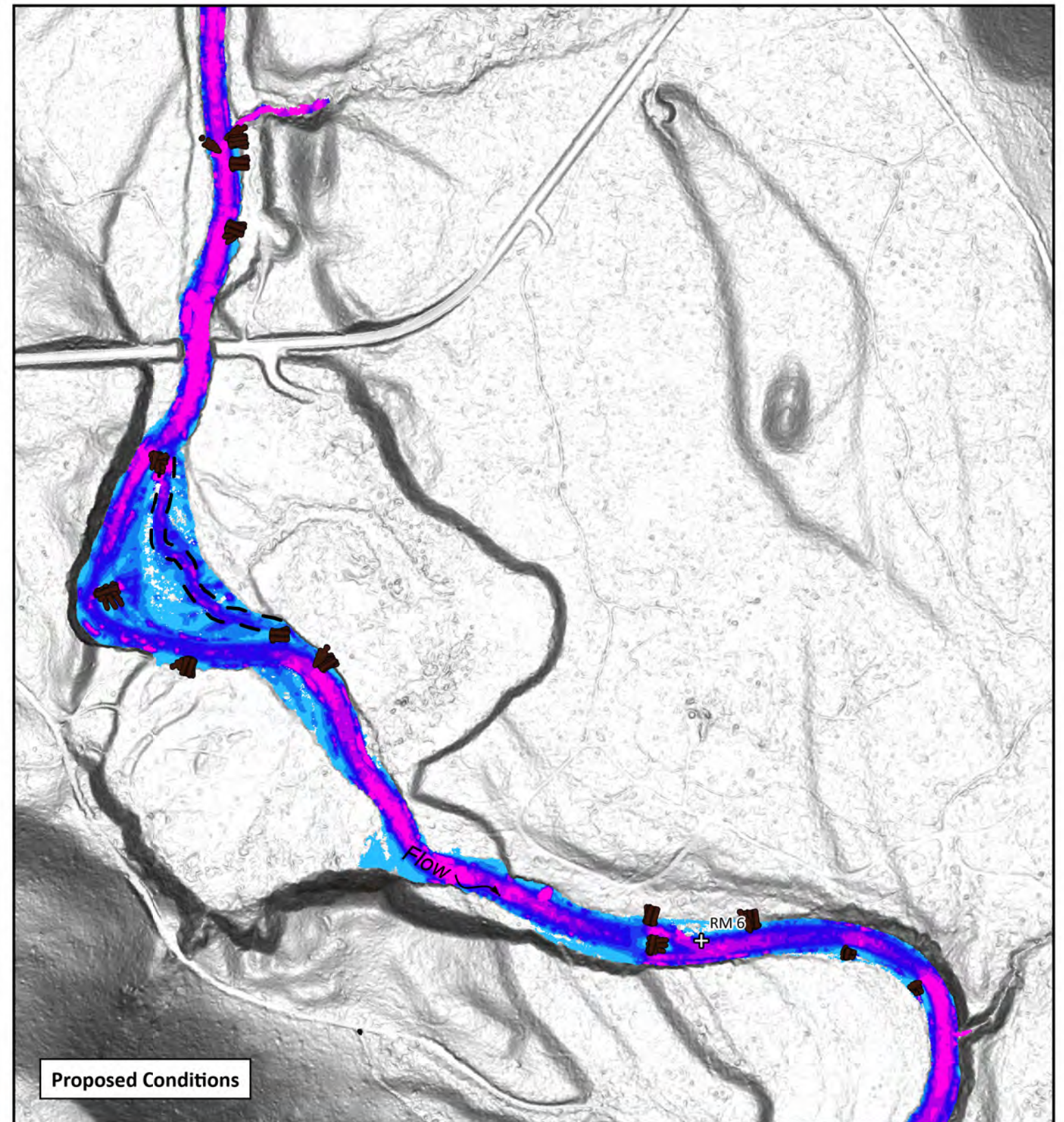
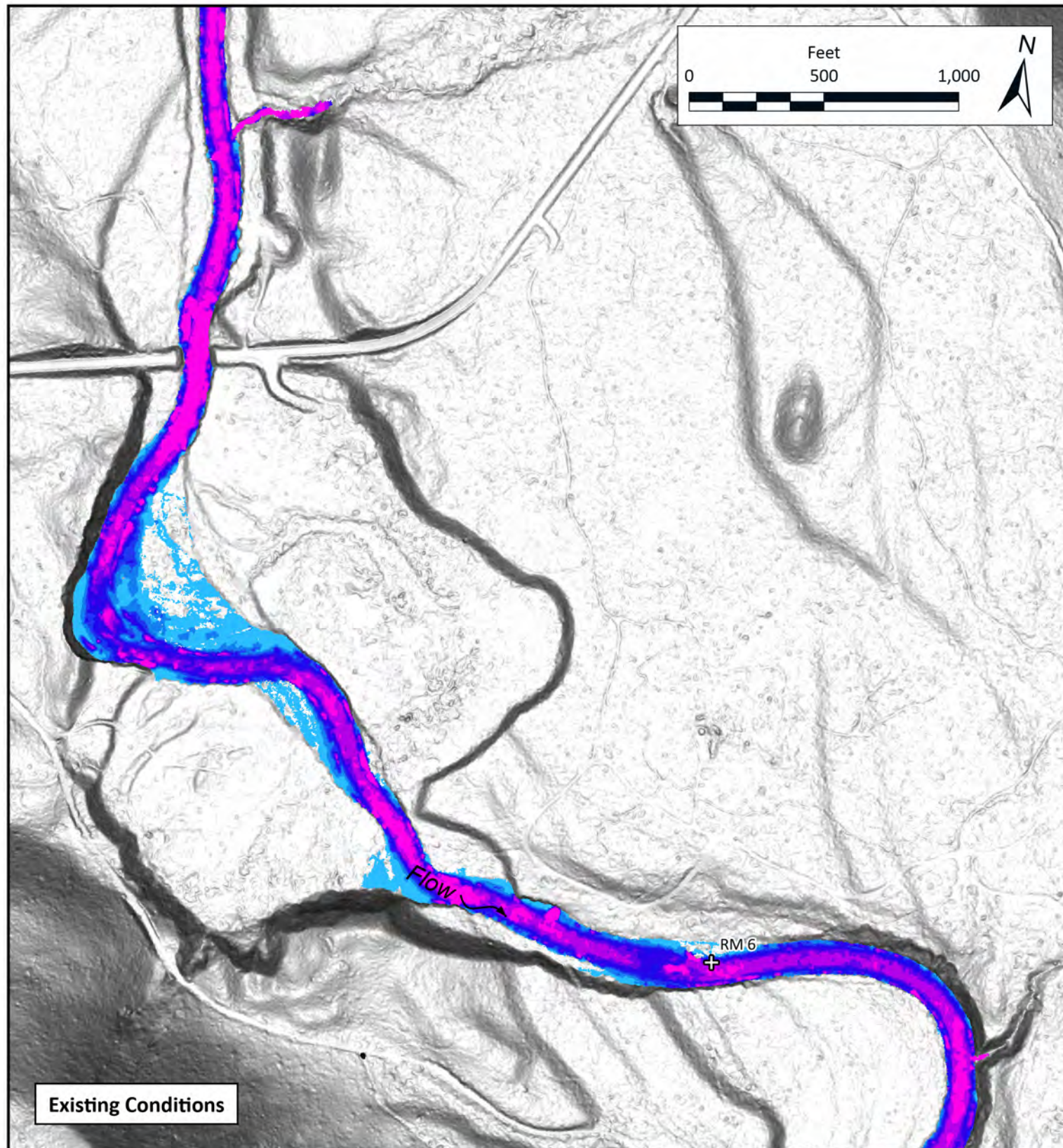


- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

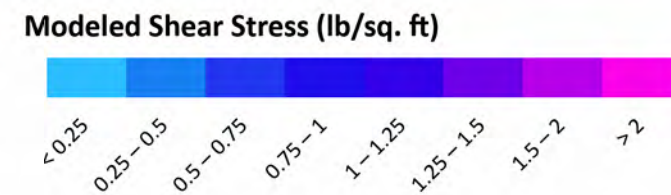


Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Shear Stress

2-Year Return Period Peak Flow:
Modeled Discharge: 3,206 cfs

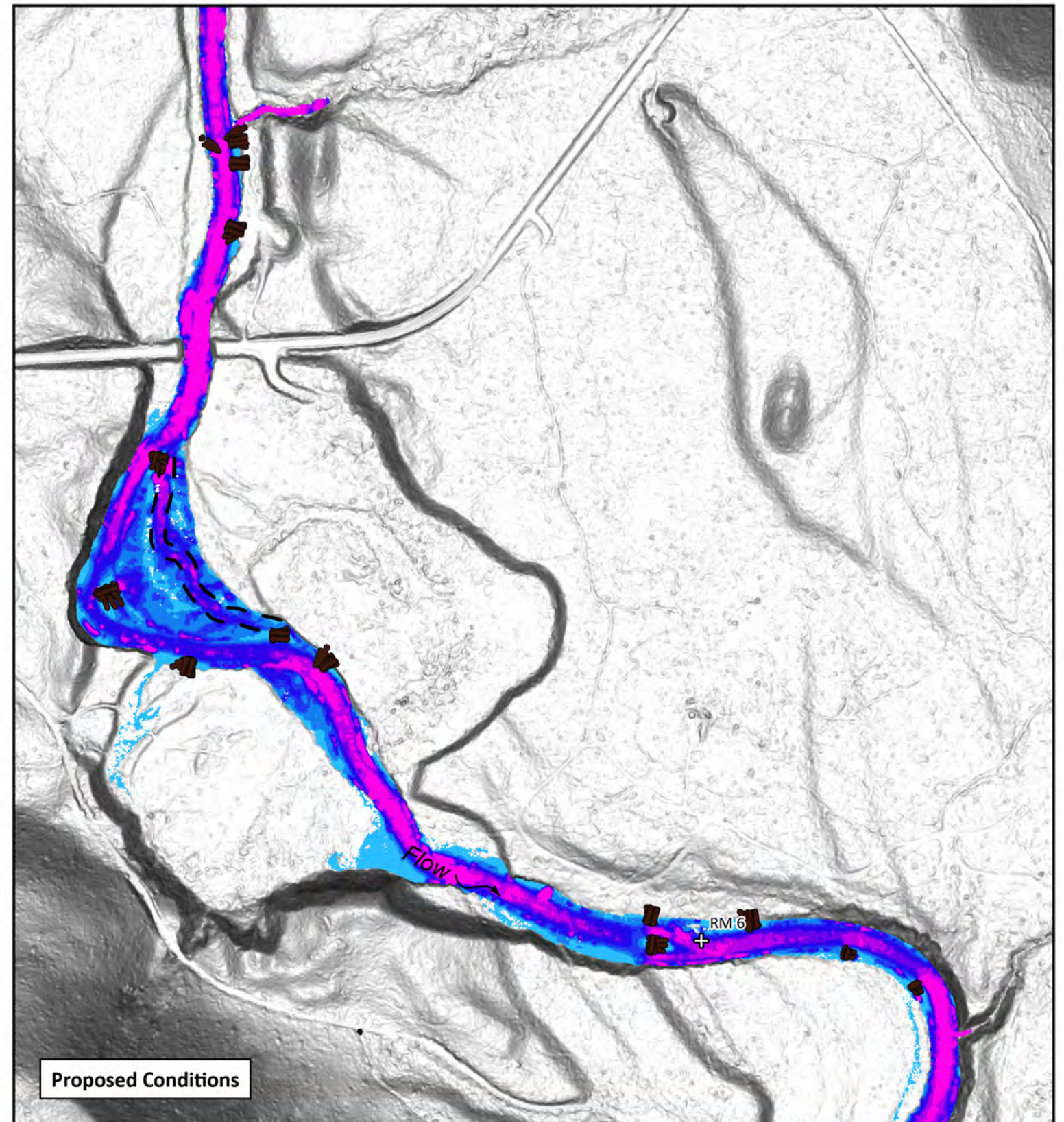
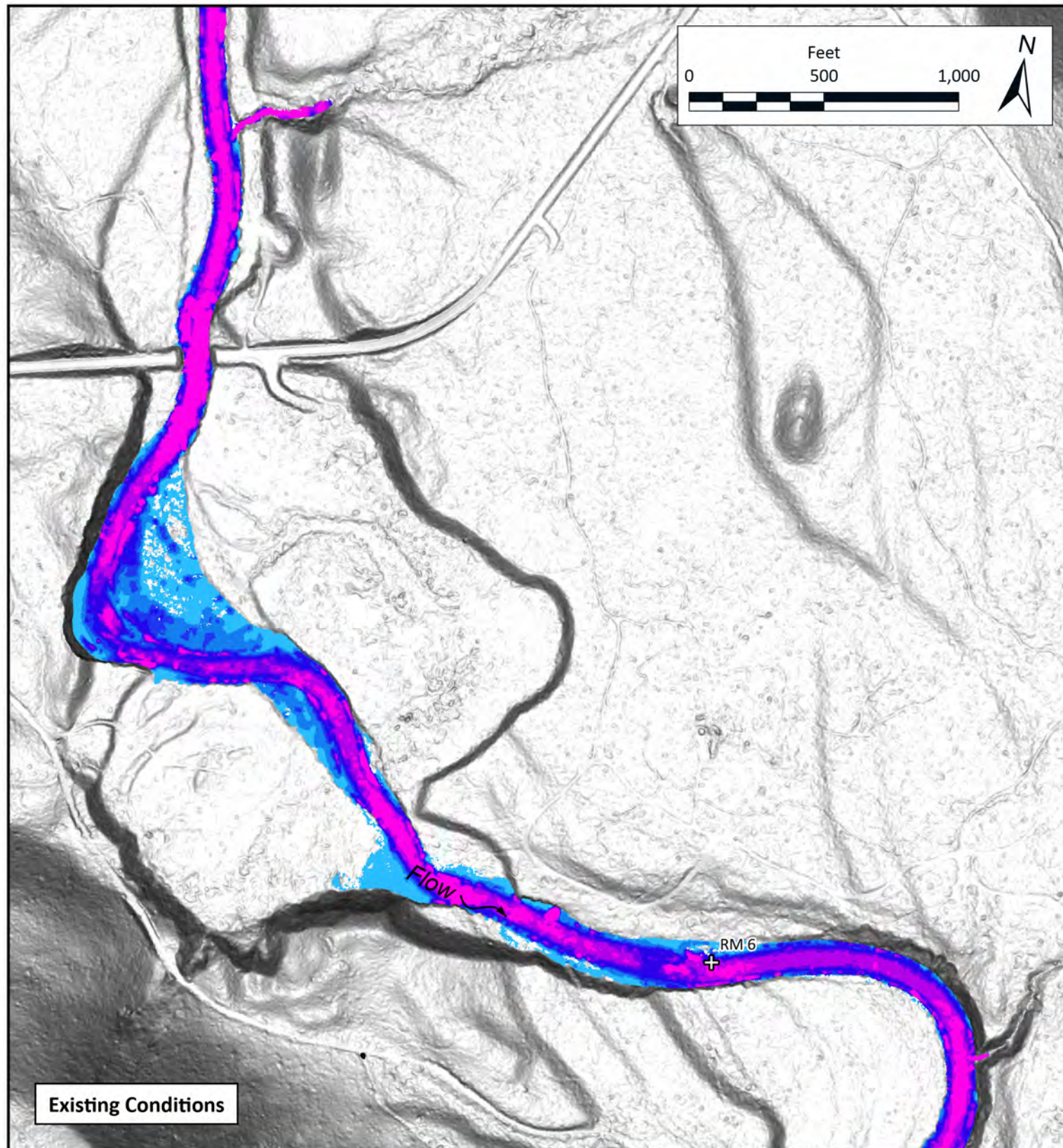


- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment

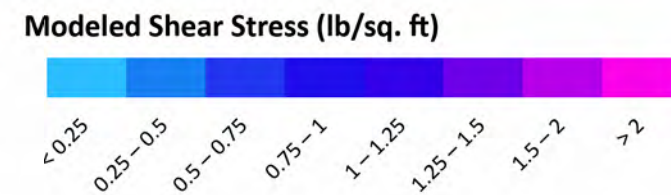


Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Shear Stress

5-Year Return Period Peak Flow:
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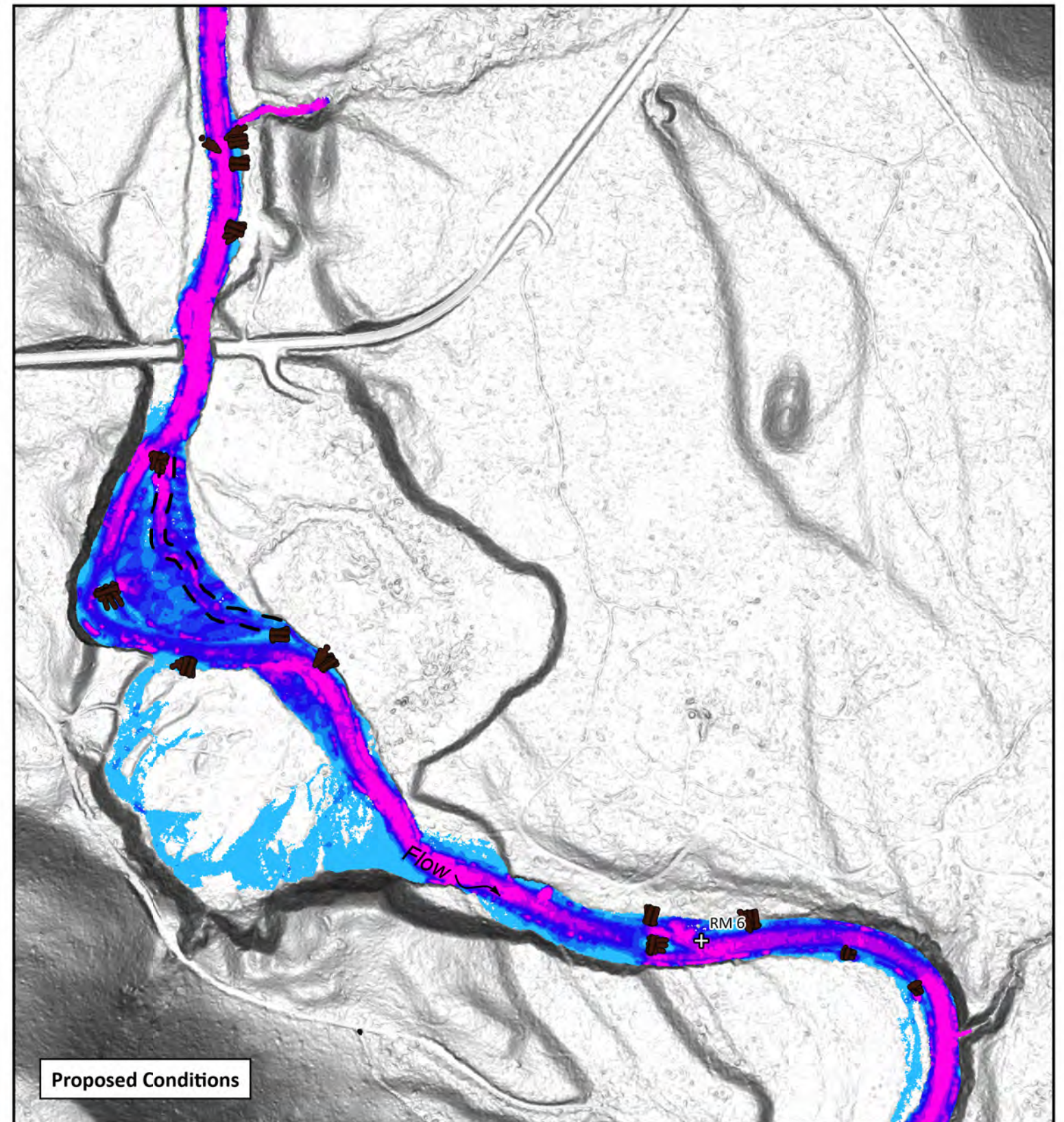
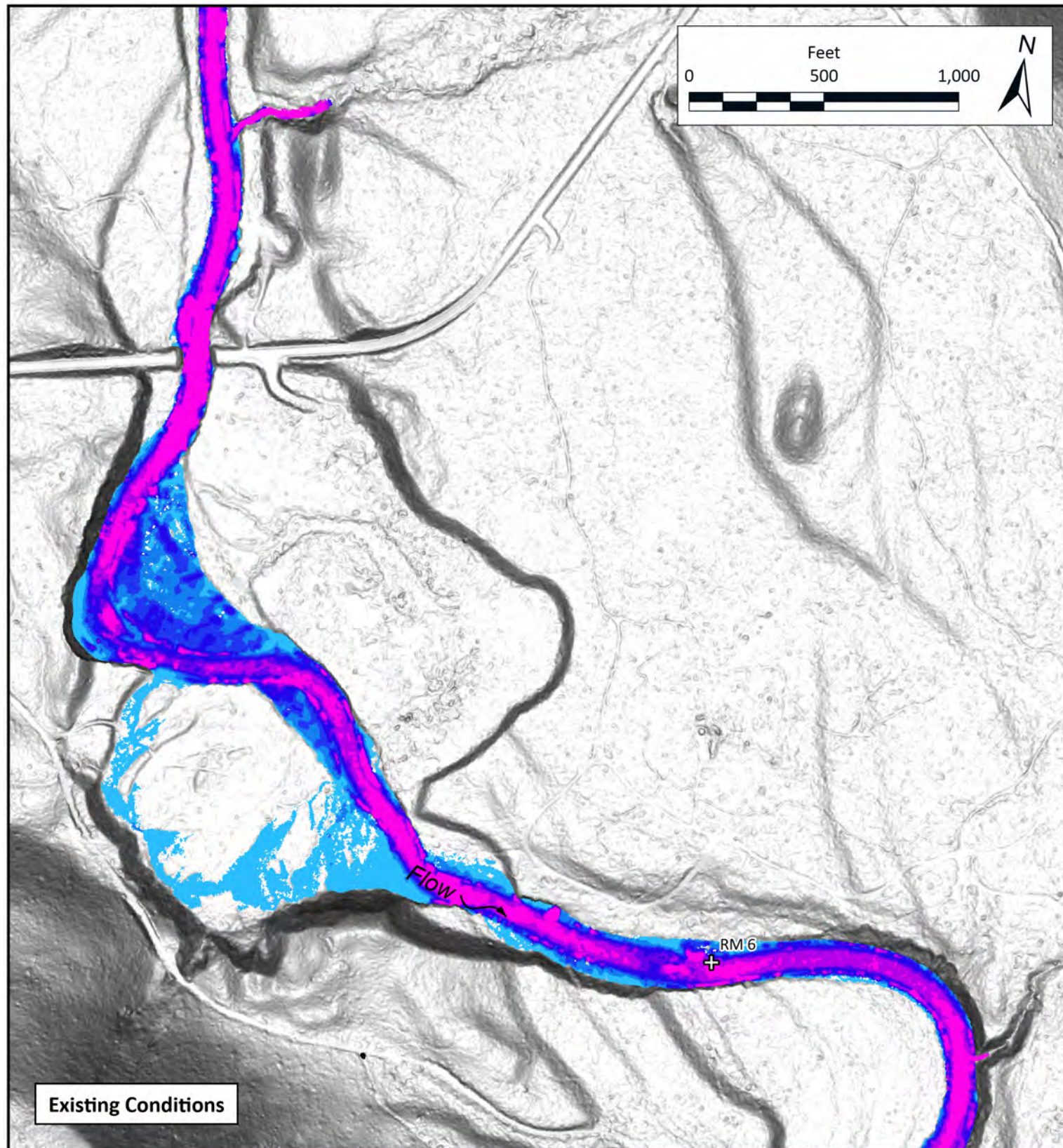


- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Side Channel Alignment

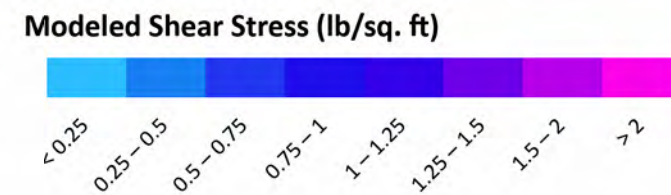


Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Shear Stress

10-Year Return Period Peak Flow:
Modeled Discharge: 5,103 cfs

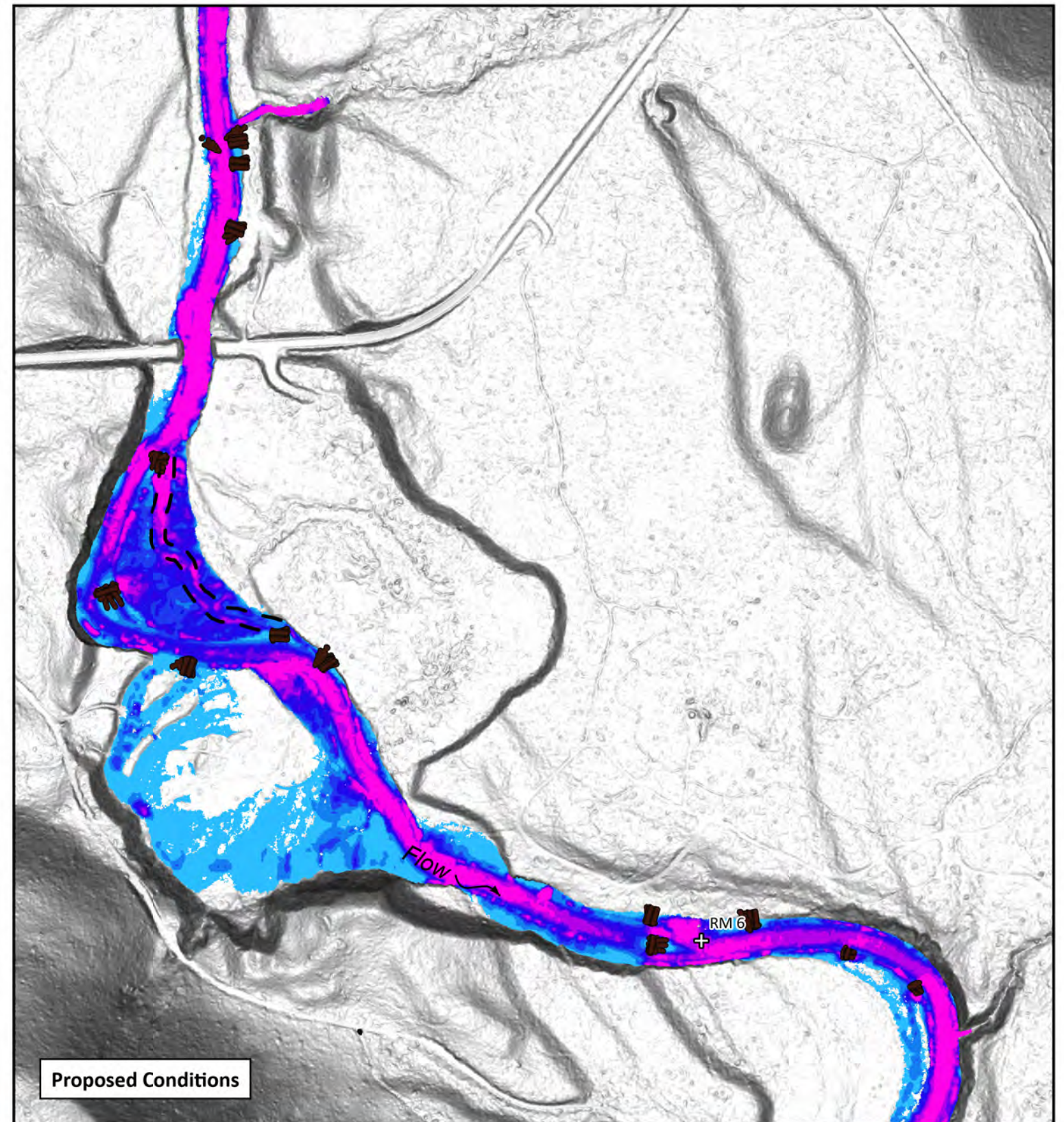
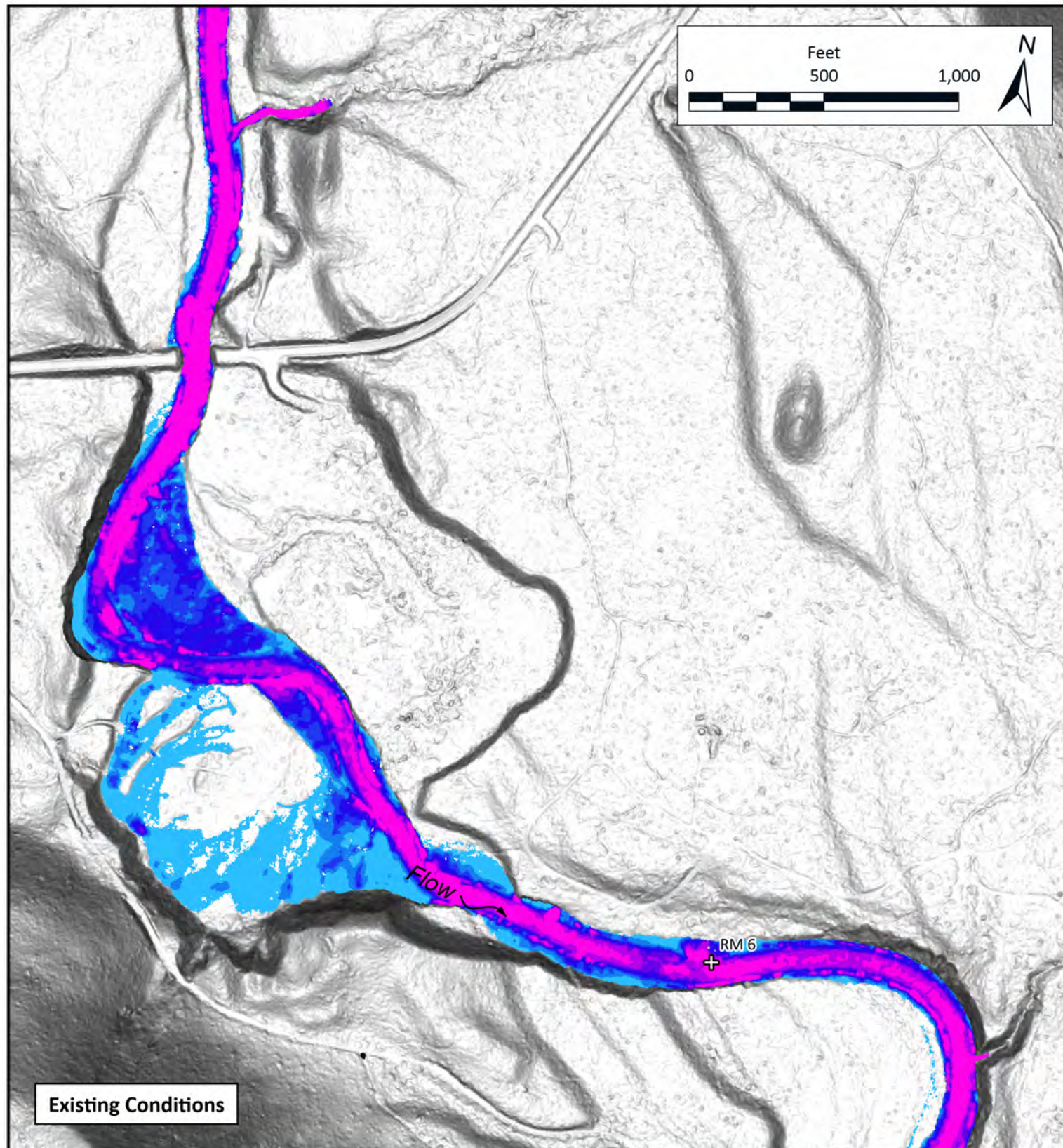


- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Channel Alignment

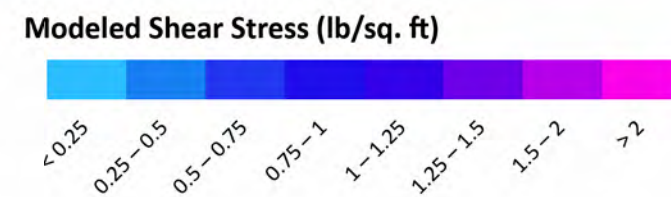


Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Shear Stress

25-Year Return Period Peak Flow:
Modeled Discharge: 6,014 cfs



- ⊕ River Miles
- Area D Proposed Large Wood Structures
- == Area D Proposed Side Channel Alignment



Lower Chiwawa Area D: 30% Design Hydraulic Model Results -- Shear Stress

100-Year Return Period Peak Flow:
Modeled Discharge: 7,328 cfs

Appendix E | Engineer's Opinion of Probable Construction Cost

Lower Chiwawa River Area D - Habitat Enhancement Project

30% Design – Engineer’s Opinion of Probable Construction Cost

October 2024

An opinion of probable construction costs for the 30% Design is included in the following table. Quantities estimates and associated costs were developed for various habitat items such as large wood habitat structures using recent construction bids from similar projects within the general region where possible. Projects located outside of the general region were also used to inform costs for certain items, as necessary. General construction costs (e.g., mobilization/demobilization, erosion/sediment control) were estimated as percentages of the overall construction costs. Other work items, such as temporary coffer dams, site restoration, and access preparation were estimated using the anticipated level of effort (scope of project) and conservative estimates of labor/equipment costs.

The current cost estimate assumes that all large wood material will need to be purchased and delivered to the project sites, with the exception salvaged trees. Salvaged trees are anticipated to be generated during clearing for access/staging. Excavation volumes were estimated from the conceptual side channel grading surface and assumptions regarding the excavation required for bank treatments. The cost estimate assumes that excavated material can be placed on site. As the project progresses, more details will be developed that will facilitate refinement of the estimated quantities and assumptions, and the resulting cost estimate.

There are a number of uncertainties at the current design phase and the construction costs can be dynamic. Costs for individual items or entire project elements may differ substantially from future cost estimates or construction bids. Given the uncertainty at the current 30% design phase, the estimated costs should be expected to have an accuracy range between -20% and +30%, per Association for Advancement of Cost Engineering (AACE) guidelines¹. Hence, a 30% contingency is included in the estimate.

¹ AACE International. (2016). Cost Estimate Classification System- As applied in engineering, procurement, and construction for the process industries. Rev Mar 1, 2016.

Engineer's Opinion of Probable Construction Costs

October 31, 2024

Lower Chiwawa River Project- Area D

30% Design

No.	Item	Unit	Quantity	Unit Cost	Cost	Notes
1.00 General Requirements					\$ 80,000	Subtotal
1.01	Mobilization/Demobilization	L.S.	1	\$ 80,000	\$ 80,000	Includes mobilization of all equipment and personnel to the project site, project site preparation not covered under other bid items, and other miscellaneous items that may be needed to perform the project work. Mobilization/Demobilization assumes a single mobilization/demobilization of equipment to the project site. Estimated as approximately 7% of Direct Costs.
2.00 Site Preparation					\$ 255,000	Subtotal
2.01	Erosion, Pollution and Sediment Control	L.S.	1	\$ 50,000	\$ 50,000	Includes development and implementation of required Erosion and Sediment Control Plan. Estimated as approximately 4% of Direct Costs.
2.02	Clearing and Grubbing	L.S.	1	\$ 15,000	\$ 15,000	Includes Clearing and Grubbing of Side Channel Work Area
2.02	Temporary Access and Staging	L.S.	1	\$ 40,000	\$ 40,000	Includes site prep, clearing, decommissioning, and restoration per USFS requirements as necessary. Assumes no major road building or stabilization. Road closure materials not included. Estimated as 3% of Direct Costs.
2.03	Diversion and Dewatering	L.S.	1	\$ 150,000	\$ 150,000	Includes Cofferdams and pumping for in-channel work
3.00 Earthwork					\$ 60,000	Subtotal
3.01	Side Channel Grading	CY	4,000	\$ 15	\$ 60,000	Assume excavation and channel geometry grading, onsite disposal with minimal shaping. Habitat Features covered under Large Wood Install
4.00 Habitat Items					\$ 974,400	Subtotal
4.01	Apex Large Wood Structures	EA	4	\$ 90,000	\$ 360,000	Includes LW procurement, haul to install site, temporary/permanent excavation, LW install, Pile install, pinning, small salvaged trees, slash
4.02	Bank-Buried LW Structures	EA	6	\$ 48,000	\$ 288,000	Includes LW procurement, haul to install site, temporary/permanent excavation, LW install, Pile install, pinning, small salvaged trees, slash
4.03	Bar Top Roughness LW Structures	EA	2	\$ 18,000	\$ 36,000	Includes LW procurement, haul to install site, LW install, local habitat creation, small salvaged trees, slash
4.04	Side Channel Habitat Wood	EA	200	\$ 1,300	\$ 260,000	Includes procurement and haul to install site of imported rootwad logs. Also Includes temporary/permanent excavation, LW install, small salvaged trees, slash
4.05	Salvaged Trees	EA	38	\$ 800	\$ 30,400	Includes salvaging/placing large trees on site with excavator
5.00 Miscellaneous Items					\$ 25,000	Subtotal
5.01	Decommission Existing Infrastructure	AC	20	\$ 2,500	\$ 50,000	Assumes decommissioning all dispersed campsites and surrounding areas, off-site haul, and disposal. Restoration or recreation improvements not included
5.02	Habitat Boulders-Imported	EA	2	\$ 4,000	\$ 8,000	Includes purchase, delivery, stockpiling, and installation of large boulders (> 6 ft diameter).
5.03	Habitat Boulders- Relocate Onsite Boulder	EA	1	\$ 1,000	\$ 1,000	Includes relocating existing large boulder to an adjacent in-channel location.
5.03	Riparian Bank Treatment Area	EA	2	\$ 8,000	\$ 16,000	Includes ~2 feet riparian excavation over area shown on plans. Assumes material will be used onsite (salvage fill), revegetation and erosion control.
6.00 Site Restoration					\$ 33,300	Subtotal
6.01	Site Decommissioning	AC	1.75	\$ 4,000	\$ 7,000	Includes Seed and mulch using erosion control seed mix. Excludes areas where recreational improvements are being designed
6.02	Site Restoration	AC	1.75	\$ 15,000	\$ 26,250	Includes revegetation of disturbed surfaces associated with habitat work and surrounding floodplain areas. Excludes areas where recreational improvements are being designed
Construction Sub-Total					\$ 1,427,700	
<i>30% Contingency (rounded to nearest hundred)</i>					<i>\$ 428,300</i>	<i>30% of Construction Sub-Total</i>
Construction Total (including Optional Items and 30% Contingency)					\$ 1,856,000	

Notes

- 1 Contingencies account for variability in project design and construction costs, rounded up.
- 2 Costs are in dollars as of 2024.
- 3 Costs do NOT include construction of new camp sites or recreation facilities
- 4 Costs do NOT include construction observation
- 5 In providing opinions of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the Consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, expressed or implied

Abbreviations

EA - each, L.S. - lump sum, LW - Large Wood

Appendix F | 30% Planset

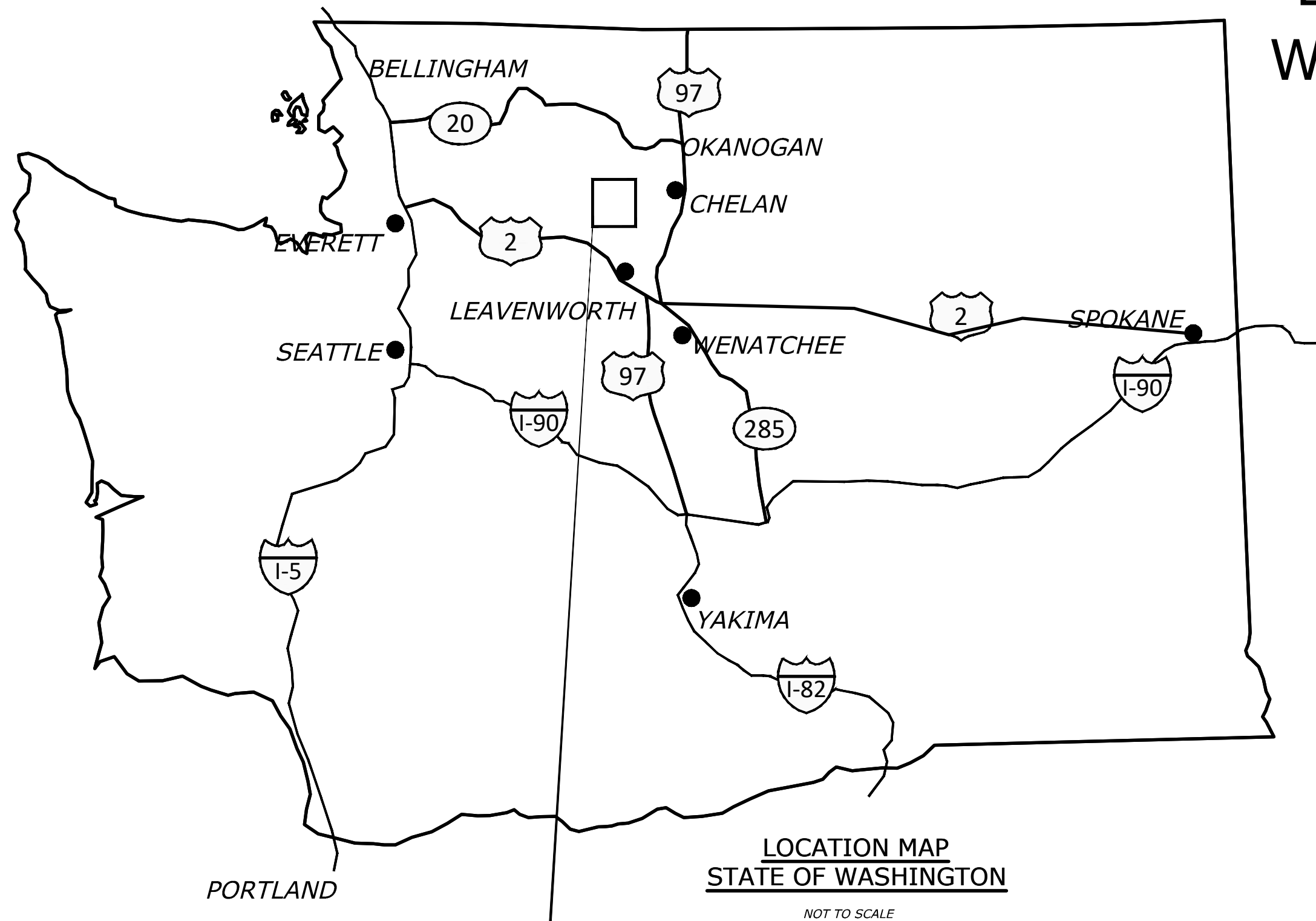
LOWER CHIWAWA RIVER PROJECT

PROJECT AREA D

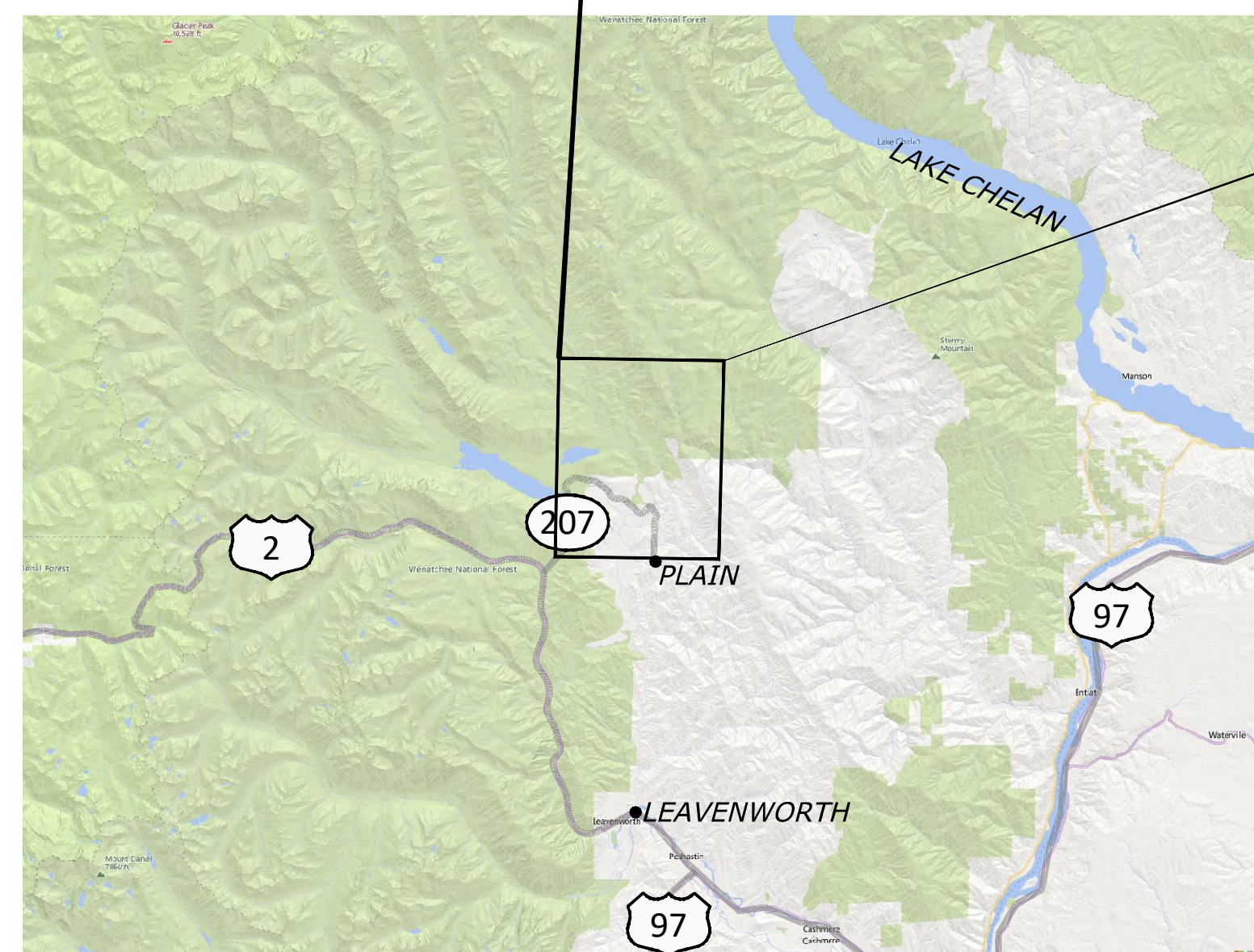
LOWER CHIWAWA RIVER ASSESSMENT UNIT

WENATCHEE RIVER SUB-BASIN, WASHINGTON

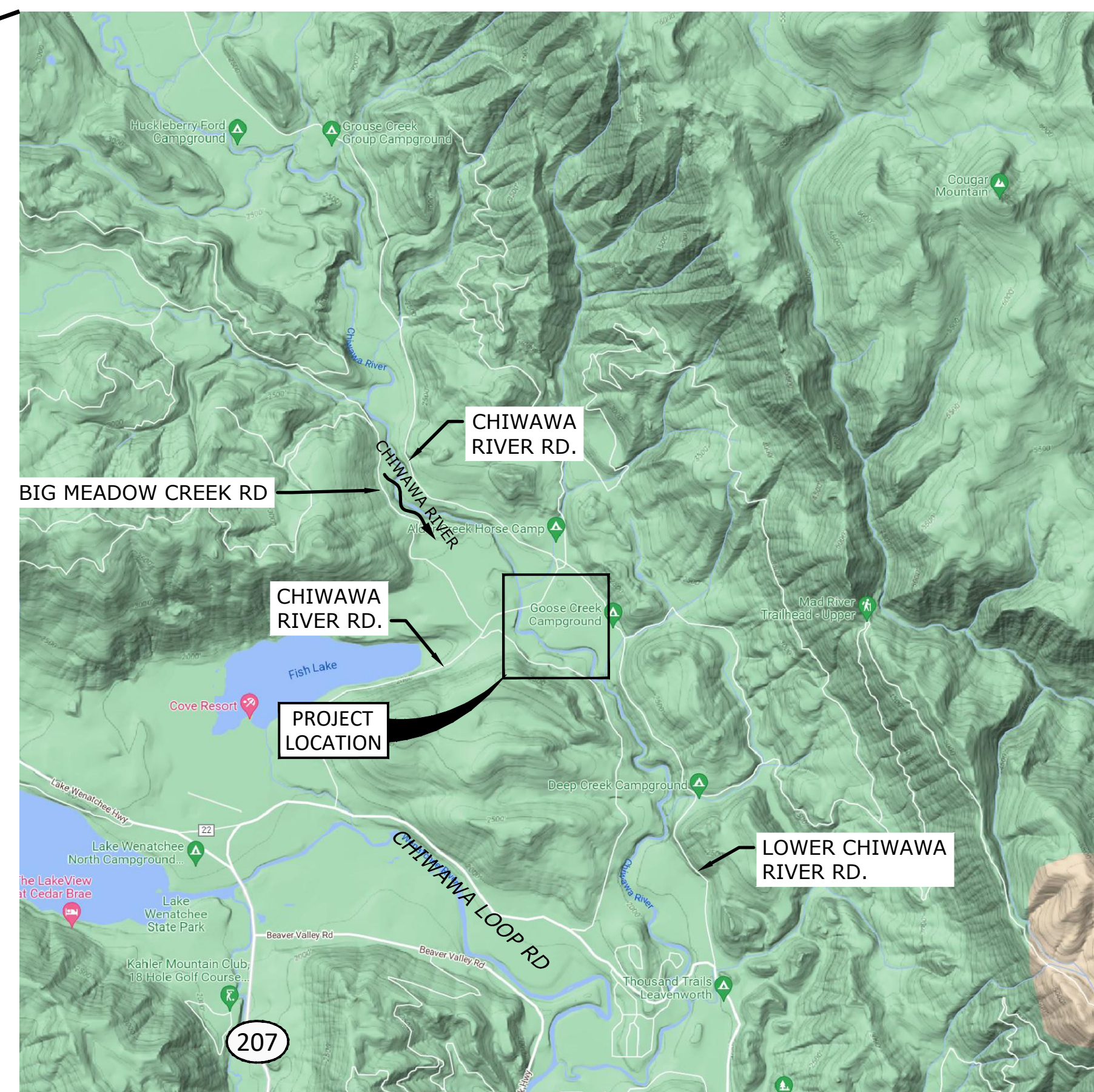
30% DESIGN DRAWINGS



Sheet List Table	
Sheet Number	Sheet Title
1	COVER SHEET
2	GENERAL NOTES
3	HIP GENERAL CONSERVATION MEASURES (1 OF 3)
4	HIP GENERAL CONSERVATION MEASURES (2 OF 3)
5	HIP GENERAL CONSERVATION MEASURES (3 OF 3)
6	TYPICAL SEDIMENT CONTROL DETAIL
7	EXISTING CONDITIONS, ACCESS AND STAGING
8	SITE OVERVIEW AND SHEET INDEX
9	PROPOSED CONDITIONS (1 OF 3)
10	PROPOSED CONDITIONS (2 OF 3)
11	PROPOSED CONDITIONS (3 OF 3)
12	SIDE CHANNEL PROFILE AND CROSS SECTION
13	TYPICAL DETAILS (1 OF 5)
14	TYPICAL DETAILS (2 OF 5)
15	TYPICAL DETAILS (3 OF 5)
16	TYPICAL DETAILS (4 OF 5)
17	TYPICAL DETAILS (5 OF 5)



VICINITY MAP
NOT TO SCALE



PROJECT LOCATION MAP
SCALE 1" = 5000'

PREPARED FOR:
CHELAN COUNTY NATURAL RESOURCES
DEPARTMENT
CONTACT: SCOTT BAILEY
411 WASHINGTON STREET, SUITE 201
WENATCHEE, WA 98801

PREPARED BY:
INTER-FLUVE
501 PORTWAY AVE, SUITE 101
HOOD RIVER, OR 97031

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION,
PACIFIC NORTHWEST REGION
CONTACT: STEVE KOLK, P.E.
1150 N. CURTIS RD.
BOISE, ID 83706



LAST SAVED DATE
2024-10-18
DRAWN BY
LACORNE
CHECKED BY
GREGG

CAD SYSTEM
AutoCAD 2025 (LMS TECH)
APP: JPL_LOWERCHIWAWA_AREA_D.DWG

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA PACIFIC NORTHWEST REGION
FCRPS HABITAT IMPROVEMENT PROGRAM
LOWER CHIWAWA ASSESSMENT UNIT
PROJECT AREA D
30% DESIGN

Preliminary
Not for Construction

CM
DRAWN

LS, PB
ACCEPTED

BOISE, ID OCTOBER 2024

COVER SHEET

SHEET 1

SHEET 1 OF 17

EXISTING DATA

TOPOGRAPHY AND BATHYMETRY WAS COLLECTED ON AUGUST 3RD AND 4TH, 2021 BY NV5G USING RED/GREEN LIDAR. AS DOCUMENTED IN THE REPORT: NV5, GEOSPATIAL, OCTOBER 5, 2021. CHEWAWA RIVER, WASHINGTON. TOPOBATHYMETRIC LIDAR TECHNICAL DATA REPORT. DATA SOLICITED BY INTER-FLUVE DELIVERED BY: NV5 GEOSPATIAL. CERTIFIED BY: VON PETER SILVIA, PLS NO. 53957.

AERIAL IMAGERY PROVIDED BY NV5

WETLANDS AND WATERS OF THE US

ORDINARY HIGH WATER DEPICTED ON THESE PLANS IS BASED ON HYDRAULIC MODEL RESULTS FOR THE 2-YEAR FLOOD.

A WETLAND ASSESSMENT WAS PERFORMED BY INTER FLUVE INC. IN 2023.

THESE DO NOT NECESSARILY REPRESENT JURISDICTIONAL BOUNDARIES. WITHIN THE STATE OF WASHINGTON, THE ARMY CORPS OF ENGINEERS AND THE DEPARTMENT OF ECOLOGY HAVE THE FINAL AUTHORITY IN DETERMINING WATERS AND WETLAND BOUNDARIES AND REGULATIONS.

SOILS

SOILS AT THE SITE ARE EXPECTED TO CONSIST OF LOWER CHIWAWA RIVER ALLUVIUM (BOULDERS/COBBLES/GRAVELS) AND FLOODPLAIN SOILS (SILT/SAND WITH COBBLES AND GRAVELS). CHORALMONT CINDERY SANDY LOAM IN THE OVERBANK AND UPLAND AREAS, PER NRCS WEB SOIL SURVEY (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx)

UTILITIES

THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR HAVING UTILITIES LOCATED PRIOR TO CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL CALL (800-424-5555) FOR UTILITY LOCATE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE EFFECTED UTILITY SERVICE TO REPORT ANY DAMAGED OR DESTROYED UTILITIES. THE CONTRACTOR SHALL PROVIDE EQUIPMENT AND LABOR TO AID THE EFFECTED UTILITY SERVICE IN REPAIRING DAMAGED OR DESTROYED UTILITIES AT NO ADDITIONAL COST TO OWNER OR PROJECT SPONSOR.

CONSTRUCTION TIMING

ALL IN-WATER CONSTRUCTION WORK SHALL OCCUR WITHIN THE DESIGNATED IN-WATER WORK WINDOW. UNLESS OTHERWISE APPROVED BY WDFW AND OTHERS IN WRITING. ALL OTHER SITE WORK SHALL OCCUR WITHIN THE DESIGNATED SEASONAL GENERAL CONSTRUCTION WORK WINDOW.

EROSION CONTROL

CONTRACTOR SHALL BE SOLELY RESPONSIBLE, AT OWN EXPENSE, FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS AND TO MAINTAIN CLEAN ACCESS ROUTES. SEE HIP GENERAL AQUATIC CONSERVATION MEASURES FOR ADDITIONAL REQUIREMENTS.

EROSION CONTROL SEED MIX

APPLY AT 20 LB/ACRE. PRIOR TO DISTRIBUTION, MIX SEED WITH 50:50 CRACKED CORN TO FACILITATE EVEN DISTRIBUTION. ALL AREAS WITHIN LIMITS OF DISTURBANCE TO BE SEEDED AND MULCHED.

FISH SALVAGE

TO BE COMPLETED BY EXPERIENCED FISH BIOLOGIST AND COORDINATED WITH OWNER. SEE USFS ARBOII

EQUIPMENT

SEE HIP IV GENERAL AQUATIC CONSERVATION MEASURES.

CULTURAL RESOURCES

PLACE HOLDER

CONSTRUCTION MEETINGS

THE CONTRACTOR SHALL ATTEND A MANDATORY PRE-BID SITE MEETING.

THE CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION MEETING WITH THE OWNER'S REPRESENTATIVE TO BEGINNING CONSTRUCTION.

CONSTRUCTION PLANS AND SPECIFICATIONS

ALL WORK SHALL CONFORM TO THE CURRENT EDITIONS OF STANDARD PLANS AND SPECIFICATIONS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT), AND LOCAL STANDARDS UNLESS INDICATED OTHERWISE BY THE CONTRACT DOCUMENTS.

CONSTRUCTION STAKING

CONTRACTOR SHALL STAKE PROJECT LIMITS AND INSTALL GRADE STAKES AND ELEVATION CONTROL POINTS. SOME FIELD ADJUSTMENTS TO THE LINES AND GRADES ARE TO BE EXPECTED.

CONTRACTOR SHALL MEET WITH THE OWNER TO DEFINE AND MARK ACCESS ROUTES AND LIMITS OF DISTURBANCE PRIOR TO MOBILIZATION OF EQUIPMENT OR MATERIALS ONTO THE SITE.

THE CONTRACTOR SHALL REPLACE DAMAGED OR DESTROYED CONSTRUCTION STAKES AT NO ADDITIONAL COST TO OWNER OR PROJECT SPONSOR.

CONSTRUCTION ACCESS

CONTRACTOR SHALL SUBMIT AN ACCESS, STAGING, AND STOCKPILE PLAN TO THE OWNER FOR APPROVAL.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ANY REQUIRED TRAFFIC CONTROL INCLUDING, BUT NOT LIMITED TO, SIGNAGE AND FLAGGERS; AND FOR OBTAINING ANY REQUIRED ACCESS PERMITS.

FOR DURATION OF PROJECT, CONTRACTOR SHALL KEEP ALL PRIVATE AND PUBLIC ROADS USED FOR ACCESS FREE OF DEBRIS AND MUD.

SEE HIP IV GENERAL AQUATIC CONSERVATION MEASURES FOR ADDITIONAL REQUIREMENTS.

TREE SALVAGE

ALL TREES TO BE REMOVED SHALL BE APPROVED AND CLEARLY MARKED BY THE OWNER'S REPRESENTATIVE.

ALL REMOVED NON-INVASIVE VEGETATION SHALL BE INCORPORATED INTO LARGE WOOD STRUCTURES AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCESS MATERIAL NEEDS DISPOSAL OUTSIDE OF CHANNEL WORK, IT SHALL BE DISTRIBUTED ON THE FLOODPLAIN AS APPROVED BY THE OWNER'S REPRESENTATIVE.

ALL TREES REMOVED WITHIN CLEARING LIMITS, UNLESS OTHERWISE NOTED, SHALL BE REMOVED WHOLE WITH ROOTS INTACT AND UTILIZED IN OTHER PROJECT WORK AS APPROVED BY OWNER'S REPRESENTATIVE.

REMOVE SOIL FROM ROOTS OF SALVAGED TREES BEFORE PLACEMENT IN THE WATERWAY.

LIVE TREES

ALL TREES NOT MARKED FOR REMOVAL SHALL BE PRESERVED AND UNDISTURBED. CONSTRUCTION ACTIVITY SHALL NOT DEBARK OR DAMAGE LIVE TREES.

KEEP OUT OF DRIP LINE OF ALL PRESERVED EXISTING TREES.

Table with 6 columns: LWS TYPE, NO. OF STRUCTURES, ROOTWAD LOG PER LWS, WHOLE TREE PER LWS, LOGS/PILE PER LWS, EXCAVATED QTY (CY) PER LWS. Includes sub-totals for LWS and CHANNEL.

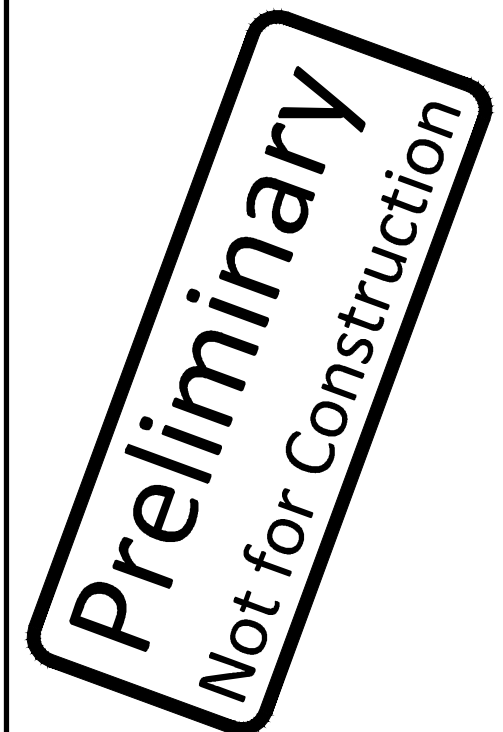
QUANTITY VALUES ARE ESTIMATES INTENDED FOR QUANTIFYING PROJECT SCALE FROM A PLANNING PERSPECTIVE. VALUES ARE SUBJECT TO CHANGE AS THE DESIGN PROGRESSES.

ABBREVIATIONS

- ° DEGREE
' FEET
" INCH
% PERCENT
APPROX. APPROXIMATE
CY. CUBIC YARD
DIA. DIAMETER
ELEV ELEVATION
ESC EROSION SEDIMENT AND CONTROL
EXIST EXISTING
FT FEET
IN INCH
INV INVERT
LWD LARGE WOODY DEBRIS
LWS LARGE WOOD STRUCTURE
MAX MAXIMUM
MIN MINIMUM
NO. NUMBER
OHW ORDINARY HIGH WATER
RD ROAD
STA STATION
TYP TYPICAL
WA WASHINGTON
YR YEAR



ALWAYS THINK SAFETY
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA PACIFIC NORTHWEST REGION
FCRPS HABITAT IMPROVEMENT PROGRAM
LOWER CHIWAWA ASSESSMENT UNIT
PROJECT AREA D
30% DESIGN



CM DRAWN

LS_PB ACCEPTED

BOISE, ID OCTOBER 2024

GENERAL NOTES

SHEET 2

SHEET 2 OF 17

LAST SAVED DATE
2024-10-18
LAST DRAWN BY
CIRCCONWELL

CAD SYSTEM
AutoCAD 2025 (LMS TECH)
JFL LOWERCHIWAWA_AREA_D.DWG

GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER ARBO ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-LISTED SPECIES. THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS, NMFS AND ADAPTED FROM THE HIP GENERAL CONSERVATION MEASURES.) WILL BE APPLIED TO ALL ACTIONS OF THIS PROJECT.

PROJECT DESIGN AND SITE PREPARATION

1. STATE AND FEDERAL PERMITS

- A. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION.
B. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USACE CLEAN WATER ACT (CWA) 404 PERMITS, AND CWA SECTION 401 WATER QUALITY CERTIFICATIONS.

2. TIMING OF IN-WATER WORK

- A. APPROPRIATE STATE (OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW), WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW), IDAHO DEPARTMENT OF FISH AND GAME (IDFG), AND MONTANA FISH WILDLIFE AND PARKS (MFWP)) GUIDELINES FOR TIMING OF IN-WATER WORK WINDOWS (IWW) WILL BE FOLLOWED.
B. CHANGES TO ESTABLISHED WORK WINDOWS WILL BE APPROVED BY REGIONAL STATE BIOLOGISTS AND REGULATORY AGENCIES.
C. BULL TROUT. FOR AREAS WITH DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR AREAS KNOWN TO HAVE BULL TROUT, PROJECT PROPONENTS WILL CONTACT THE APPROPRIATE USFWS FIELD OFFICE TO INSURE THAT ALL REASONABLE IMPLEMENTATION MEASURES ARE CONSIDERED AND AN APPROPRIATE IN-WATER WORK WINDOW IS BEING USED TO MINIMIZE PROJECT EFFECTS.
D. LAMPREY. WORKING IN STREAM OR RIVER CHANNELS THAT CONTAIN PACIFIC LAMPREY WILL BE AVOIDED FROM MARCH 1 TO JULY 1 FOR REACHES <5,000 FEET IN ELEVATION AND FROM MARCH 1 TO AUGUST 1 FOR REACHES >5,000 FEET. IF EITHER TIMEFRAME IS INCOMPATIBLE WITH OTHER OBJECTIVES, THE AREA WILL BE SURVEYED FOR NESTS AND LAMPREY PRESENCE, AND AVOIDED IF POSSIBLE. IF LAMPREYS ARE KNOWN TO EXIST, THE PROJECT SPONSOR WILL UTILIZE DEWATERING AND SALVAGE PROCEDURES (SEE FISH SALVAGE AND ELECTROFISHING SECTIONS) TO MINIMIZE ADVERSE EFFECTS.
E. THE IN-WATER WORK WINDOW WILL BE JULY 1 THROUGH JULY 31.

3. CONTAMINANTS

- A. EXCAVATION OF MORE THAN 20 CUBIC YARDS WILL REQUIRE A SITE VISIT AND DOCUMENTED ASSESSMENT FOR POTENTIAL CONTAMINANT SOURCES. THE SITE ASSESSMENT WILL BE STORED WITH PROJECT FILES OR AS AN APPENDIX TO THE BASIS OF DESIGN REPORT.
B. THE SITE ASSESSMENT WILL SUMMARIZE:
1. THE SITE VISIT, CONDITION OF THE PROPERTY, AND IDENTIFICATION OF ANY AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES;
2. AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;
3. INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND
4. THE TYPE, QUANTITY, AND EXTENT OF ANY POTENTIAL CONTAMINATION SOURCES.

4. SITE LAYOUT AND FLAGGING

- A. CONSTRUCTION AREAS TO BE CLEARLY FLAGGED PRIOR TO CONSTRUCTION
B. AREAS TO BE FLAGGED WILL INCLUDE:
1. SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;
2. EQUIPMENT ENTRY AND EXIT POINTS;
3. ROAD AND STREAM CROSSING ALIGNMENTS;
4. STAGING, STORAGE, AND STOCKPILE AREAS; AND
5. NO-SPRAY AREAS AND BUFFERS.

5. TEMPORARY ACCESS ROADS AND PATHS

- A. EXISTING ACCESS ROADS AND PATHS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER AND LENGTH OF TEMPORARY ACCESS ROADS AND PATHS THROUGH RIPARIAN AREAS AND FLOODPLAINS WILL BE MINIMIZED.
B. VEHICLE USE AND HUMAN ACTIVITIES, INCLUDING WALKING, IN AREAS OCCUPIED BY TERRESTRIAL ESA-LISTED SPECIES WILL BE MINIMIZED.
C. TEMPORARY ACCESS ROADS AND PATHS WILL NOT BE BUILT ON SLOPES WHERE GRADE, SOIL, OR OTHER FEATURES SUGGEST A LIKELIHOOD OF EXCESSIVE EROSION OR FAILURE. IF SLOPES ARE STEEPER THAN 30%, THEN THE ROAD WILL BE DESIGNED BY A CIVIL ENGINEER WITH EXPERIENCE IN STEEP ROAD DESIGN.
D. THE REMOVAL OF RIPARIAN VEGETATION DURING CONSTRUCTION OF TEMPORARY ACCESS ROADS WILL BE MINIMIZED. WHEN TEMPORARY VEGETATION REMOVAL IS REQUIRED, VEGETATION WILL BE CUT AT GROUND LEVEL (NOT GRUBBED). TREES SUITABLE FOR USE IN LARGE WOOD STRUCTURES WILL BE HARVESTED WITH ROOTS AND BRANCHES INTACT TO THE EXTENT PRACTICABLE. SOIL WILL BE REPLACED INTO THE ROOT CAVITY AND SMOOTHED TO THE NATIVE CONTOURS.
E. AT PROJECT COMPLETION, ALL TEMPORARY ACCESS ROADS AND PATHS WILL BE OBLITERATED, AND THE SOIL WILL BE STABILIZED AND REVEGETATED. ROAD AND PATH OBLITERATION REFERS TO THE MOST COMPREHENSIVE DEGREE OF DECOMMISSIONING AND INVOLVES DECOMPACTING THE SURFACE AND DITCH, PULLING THE FILL MATERIAL ONTO THE RUNNING SURFACE, AND RESHAPING TO MATCH THE ORIGINAL CONTOUR.

6. TEMPORARY STREAM CROSSINGS

- A. EXISTING STREAM CROSSINGS OR BEDROCK WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER OF TEMPORARY STREAM CROSSINGS WILL BE MINIMIZED.
B. TEMPORARY BRIDGES AND CULVERTS WILL BE INSTALLED TO ALLOW FOR EQUIPMENT AND VEHICLE CROSSING OVER PERENNIAL STREAMS DURING CONSTRUCTION. TREATED WOOD SHALL NOT BE USED ON TEMPORARY BRIDGE CROSSINGS OR IN LOCATIONS IN CONTACT WITH OR DIRECTLY OVER WATER.
C. FOR PROJECTS THAT REQUIRE EQUIPMENT AND VEHICLES TO CROSS IN THE WET:
1. THE LOCATION AND NUMBER OF ALL WET CROSSINGS SHALL BE APPROVED BY THE EC LEAD AND DOCUMENTED IN THE CONSTRUCTION PLANS;
2. VEHICLES AND MACHINERY SHALL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHENEVER POSSIBLE;
3. NO STREAM CROSSINGS WILL OCCUR 300 FEET UPSTREAM OR 100 FEET DOWNSTREAM OF AN EXISTING REDD OR SPAWNING FISH; AND
4. AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND BANKS RESTORED.

7. STAGING, STORAGE, AND STOCKPILE AREAS

- A. STAGING AREAS (USED FOR CONSTRUCTION EQUIPMENT STORAGE, VEHICLE STORAGE, FUELING, SERVICING, AND HAZARDOUS MATERIAL STORAGE) WILL BE 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND. STAGING AREAS CLOSER THAN 150 FEET WILL BE APPROVED BY THE EC LEAD.
B. NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN 150 FEET IF CLEARLY INDICATED IN THE PLANS THAT AREA IS FOR NATURAL MATERIALS ONLY.
C. ANY LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL DISPLACED BY CONSTRUCTION WILL BE STOCKPILED FOR USE DURING SITE RESTORATION AT A SPECIFICALLY IDENTIFIED AND FLAGGED AREA.
D. ANY MATERIAL NOT USED IN RESTORATION, AND NOT NATIVE TO THE FLOODPLAIN, WILL BE DISPOSED OF OUTSIDE THE 100-YEAR FLOODPLAIN.

8. EQUIPMENT

- A. MECHANIZED EQUIPMENT AND VEHICLES WILL BE SELECTED, OPERATED, AND MAINTAINED IN A MANNER THAT MINIMIZES ADVERSE EFFECTS ON THE ENVIRONMENT (E.G., MINIMALLY-SIZED, LOW PRESSURE TIRES; MINIMAL HARD-TURN PATHS FOR TRACKED VEHICLES; TEMPORARY MATS OR PLATES WITHIN WET AREAS OR ON SENSITIVE SOILS).
B. EQUIPMENT WILL BE STORED, FUELED, AND MAINTAINED IN AN CLEARLY IDENTIFIED STAGING AREA THAT MEETS STAGING AREA CONSERVATION MEASURES.
C. EQUIPMENT WILL BE REFUELED IN A VEHICLE STAGING AREA OR IN AN ISOLATED HARD ZONE, SUCH AS A PAVED PARKING LOT OR ADJACENT, ESTABLISHED ROAD (THIS MEASURE APPLIES ONLY TO GAS-POWERED EQUIPMENT WITH TANKS LARGER THAN 5 GALLONS).
D. BIODEGRADABLE LUBRICANTS AND FLUIDS WILL BE USED ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER.
E. EQUIPMENT WILL BE INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND.
F. EQUIPMENT WILL BE THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

9. EROSION CONTROL

- A. TEMPORARY EROSION CONTROL MEASURES INCLUDE:
1. TEMPORARY EROSION CONTROLS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE;
2. IF THERE IS A POTENTIAL FOR ERODED SEDIMENT TO ENTER THE STREAM, SEDIMENT BARRIERS WILL BE INSTALLED AND MAINTAINED FOR THE DURATION OF PROJECT IMPLEMENTATION;
3. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE SEDGE MATS, FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC;
4. SOIL STABILIZATION UTILIZING WOOD FIBER MULCH AND TACKIFIER (HYDRO-APPLIED) MAY BE USED TO REDUCE EROSION OF BARE SOIL IF THE MATERIALS ARE NOXIOUS WEED FREE AND NONTOXIC TO AQUATIC AND TERRESTRIAL ANIMALS, SOIL MICROORGANISMS, AND VEGETATION;
5. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL; AND
6. ONCE THE SITE IS STABILIZED AFTER CONSTRUCTION, TEMPORARY EROSION CONTROL MEASURES WILL BE REMOVED.
B. EMERGENCY EROSION CONTROLS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:
1. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND
2. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10. DUST ABATEMENT

- A. THE PROJECT SPONSOR WILL DETERMINE THE APPROPRIATE DUST CONTROL MEASURES BY CONSIDERING SOIL TYPE, EQUIPMENT USAGE, PREVAILING WIND DIRECTION, AND THE EFFECTS CAUSED BY OTHER EROSION AND SEDIMENT CONTROL MEASURES.
B. WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.
C. DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS (TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET OF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING MIXED 50:50 WITH WATER.
D. APPLICATION OF DUST ABATEMENT CHEMICALS WILL BE AVOIDED DURING OR JUST BEFORE WET WEATHER, AND AT STREAM CROSSINGS OR OTHER AREAS THAT COULD RESULT IN UNFILTERED DELIVERY OF THE DUST ABATEMENT MATERIALS TO A WATERBODY (TYPICALLY THESE WOULD BE AREAS WITHIN 25 FEET OF A WATERBODY OR STREAM CHANNEL; DISTANCES MAY BE GREATER WHERE VEGETATION IS SPARSE OR SLOPES ARE STEEP).
E. SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION OF DUST ABATEMENT CHEMICALS.
F. PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

11. SPILL PREVENTION, CONTROL, AND COUNTER MEASURES

- A. A DESCRIPTION OF HAZARDOUS MATERIALS THAT WILL BE USED, INCLUDING INVENTORY, STORAGE, AND HANDLING PROCEDURES WILL BE AVAILABLE ON-SITE.
B. WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.
C. SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIALS USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.
D. WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.
E. ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.
F. PUMPS USED ADJACENT TO WATER SHALL USE SPILL CONTAINMENT SYSTEMS.

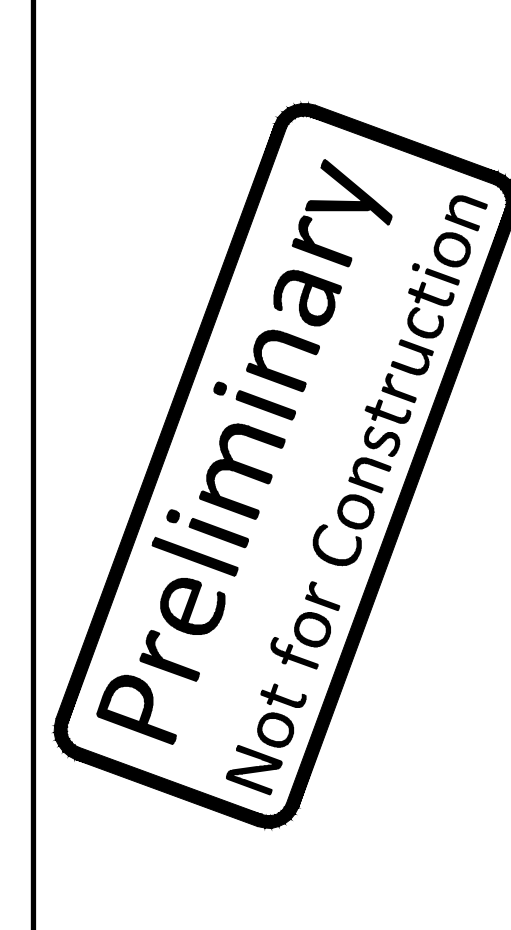
12. INVASIVE SPECIES CONTROL

- A. PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.
B. WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES.
C. WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES UNLESS DECONTAMINATION PROCEDURES HAVE BEEN APPROVED BY THE EC LEAD.



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LOWER CHIWAWA ASSESSMENT UNIT
PROJECT AREA D
30% DESIGN



CM DRAWN
LS_PB ACCEPTED
BOISE, ID OCTOBER 2024

HIP GENERAL CONSERVATION MEASURES (1 OF 3)
SHEET 3

SHEET 3 OF 17

LAST SAVED DATE
2024-10-18
LAST DRAWN BY
GREGG WELLS

CAD SYSTEM
AutoCAD 2025 (LMS TECH)
PFL LOWERCHIWAWA AREA_D.DWG

WORK AREA ISOLATION AND FISH SALVAGE

1. WORK AREA ISOLATION

- A. ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT, OR IF THE WORK AREA IS LESS THAN 300-FEET UPSTREAM FROM KNOWN SPAWNING HABITATS.
B. WORK AREA ISOLATION AND FISH SALVAGE ACTIVITIES WILL COMPLY WITH THE IN-WATER WORK WINDOW.
C. DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS AND AREAS (COFFER DAMS, PUMPS, DISCHARGE AREAS, FISH SCREENS, FISH RELEASE AREAS, ETC.).
D. WORK AREA ISOLATION AND FISH CAPTURE ACTIVITIES WILL OCCUR DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE, NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS AND DEATH OF SPECIES PRESENT.

2. FISH SALVAGE

- A. MONITORING AND RECORDING WILL TAKE PLACE FOR DURATION OF SALVAGE. THE SALVAGE REPORT WILL BE COMMUNICATED TO AGENCIES VIA THE PROJECT COMPLETION FORM (PCF).
B. SALVAGE ACTIVITIES SHOULD TAKE PLACE DURING CONDITIONS TO MINIMIZE STRESS TO FISH SPECIES, TYPICALLY PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES WHICH OCCUR IN THE MORNING VERSUS LATE IN THE DAY.
C. SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODS, AND CONSERVATION MEASURES SPECIFIED BELOW:
1. SLOWLY REDUCE WATER FROM THE WORK AREA TO ALLOW SOME FISH TO LEAVE VOLITIONALLY.
2. BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.
3. BLOCK NETS WILL BE SECURED TO THE STREAM CHANNEL BED AND BANKS UNTIL FISH CAPTURE AND TRANSPORT ACTIVITIES ARE COMPLETE. BLOCK NETS MAY BE LEFT IN PLACE FOR THE DURATION OF THE PROJECT TO EXCLUDE FISH AS LONG AS PASSAGE REQUIREMENTS ARE MET.
4. NETS WILL BE MONITORED HOURLY DURING IN-STREAM DISTURBANCE.
5. IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED AND FREE OF ORGANIC ACCUMULATION. IF BULL TROUT ARE PRESENT, NETS ARE TO BE CHECKED EVERY 4 HOURS FOR FISH IMPINGEMENT.
6. CAPTURE FISH THROUGH SEINING AND RELOCATE TO STREAMS.
7. WHILE DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
8. SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
9. MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
10. ELECTROFISH TO CAPTURE AND RELOCATED FISH NOT CAUGHT DURING SEINING PER ELECTROFISH CONSERVATION MEASURES.
11. CONTINUE TO SLOWLY DEWATER STREAM REACH.
12. COLLECT ANY REMAINING FISH IN COLD-WATER BUCKETS AND RELOCATED TO THE STREAM.
13. LIMIT THE TIME FISH ARE IN A TRANSPORT BUCKET.
14. MINIMIZE PREDATION BY TRANSPORTING COMPARABLE SIZES IN BUCKETS.
15. BUCKET WATER TO BE CHANGED EVERY 15 MINUTES OR AERATED.
16. BUCKETS WILL BE KEPT IN SHADED AREAS OR COVERED.
17. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.
D. SALVAGE GUIDELINES FOR BULL TROUT, LAMPREY, MUSSELS, AND NATIVE FISH
1. CONDUCT SITE SURVEY TO ESTIMATE SALVAGE NUMBERS.
2. PRE-SELECT SITE(S) FOR RELEASE AND/OR MUSSEL BED RELOCATION.
3. SALVAGE OF BULL TROUT WILL NOT TAKE PLACE WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.
4. IF DRAWDOWN LESS THAN 48 HOURS, SALVAGE OF LAMPREY AND MUSSELS MAY NOT BE NECESSARY IF TEMPERATURES SUPPORT SURVIVAL IN SEDIMENTS.
5. SALVAGE MUSSELS BY HAND, LOCATING BY SNORKELING OR WADING.
6. SALVAGE LAMPREY BY ELECTROFISHING (SEE ELECTROFISHING FOR LARVAL LAMPREY SETTINGS AND LARVAL LAMPREY DRY SHOCKING SETTINGS).
7. SALVAGE BONY FISH AFTER LAMPREY WITH NETS OR ELECTROFISHING (SEE ELECTROFISHING FOR APPROPRIATE SETTINGS).
8. REGULARLY INSPECT DEWATERED SITE SINCE LAMPREY LIKELY TO EMERGE AFTER DEWATERING AND MUSSELS MAY BECOME VISIBLE.
9. MUSSELS MAY BE TRANSFERRED IN COOLERS.
10. MUSSELS WILL BE PLACED INDIVIDUALLY TO ENSURE ABILITY TO BURROW INTO NEW HABITAT.

3. ELECTROFISHING

- A. INITIAL SITE SURVEY AND INITIAL SETTINGS
1. IDENTIFY SPAWNING ADULTS AND ACTIVE REDDS TO AVOID.
2. RECORD WATER TEMPERATURE. ELECTROFISHING WILL NOT OCCUR WHEN WATER TEMPERATURES ARE ABOVE 18 DEGREES CELSIUS.
3. IF POSSIBLE, A BLOCK NET WILL BE PLACED DOWNSTREAM AND CHECKED REGULARLY TO CAPTURE STUNNED FISH THAT DRIFT DOWNSTREAM.
4. INITIAL SETTINGS WILL BE 100 VOLTS, PULSE WIDTH OF 500 MICRO SECONDS, AND PULSE RATE OF 30 HERTZ.
5. RECORDS FOR CONDUCTIVITY, WATER TEMPERATURE, AIR TEMPERATURE, ELECTROFISHING SETTINGS, ELECTROFISHER MODEL, ELECTROFISHER CALIBRATION, FISH CONDITIONS, FISH MORTALITIES, AND TOTAL CAPTURE RATES WILL BE INCLUDED IN THE SALVAGE LOG BOOK.
B. ELECTROFISHING TECHNIQUE
1. SAMPLING WILL BEGIN USING STRAIGHT DC. POWER WILL REMAIN ON UNTIL THE FISH IS NETTED WHEN USING STRAIGHT DC GRADUALLY INCREASE VOLTAGE WHILE REMAINING BELOW MAXIMUM LEVELS.
2. MAXIMUM VOLTAGE WILL BE 1100 VOLTS WHEN CONDUCTIVITY IS <100 MILLISECONDS, 800 VOLTS WHEN CONDUCTIVITY IS BETWEEN 100 AND 300 MILLISECONDS, AND 400 VOLTS WHEN CONDUCTIVITY IS >300 MILLISECONDS.
3. IF FISH CAPTURE IS NOT SUCCESSFUL USING STRAIGHT DC, THE ELECTROFISHER WILL BE SET TO INITIAL VOLTAGE FOR PDC. VOLTAGE, PULSE WIDTH, AND PULSE FREQUENCY WILL BE GRADUALLY INCREASED WITHIN MAXIMUM VALUES UNTIL CAPTURE IS SUCCESSFUL.
4. MAXIMUM PULSE WIDTH IS 5 MILLISECONDS. MAXIMUM PULSE RATE IS 70 HERTZ
5. ELECTROFISHING WILL NOT OCCUR IN ONE AREA FOR AN EXTENDED PERIOD.
6. THE ANODE WILL NOT INTENTIONALLY COME INTO CONTACT WITH FISH. THE ZONE FOR POTENTIAL INJURY OF 0.5 M FROM THE ANODE WILL BE AVOIDED.
7. SETTINGS WILL BE LOWERED IN SHALLOWER WATER SINCE VOLTAGE GRADIENTS LIKELY TO INCREASE.
8. ELECTROFISHING WILL NOT OCCUR IN TURBID WATER WHERE VISIBILITY IS POOR (I.E. UNABLE TO SEE THE BED OF THE STREAM).
9. OPERATIONS WILL IMMEDIATELY STOP IF MORTALITY OR OBVIOUS FISH INJURY IS OBSERVED. ELECTROFISHING SETTINGS WILL BE REEVALUATED.
C. SAMPLE PROCESSING
1. FISH SHALL BE SORTED BY SIZE TO AVOID PREDATION DURING CONTAINMENT.
2. SAMPLERS WILL REGULARLY CHECK CONDITIONS OF FISH HOLDING CONTAINERS, AIR PUMPS, WATER TRANSFERS, ETC.
3. FISH WILL BE OBSERVED FOR GENERAL CONDITIONS AND INJURIES
4. EACH FISH WILL BE COMPLETELY REVIVED BEFORE RELEASE. ESA-LISTED SPECIES WILL BE PRIORITIZED FOR SUCCESSFUL RELEASE.
D. BULL TROUT ELECTROFISHING
1. ELECTROFISHING FOR BULL TROUT WILL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. IN FMO HABITATS ELECTROFISHING MAY OCCUR ANY TIME.
2. ELECTROFISHING OF BULL TROUT WILL NOT OCCUR WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.

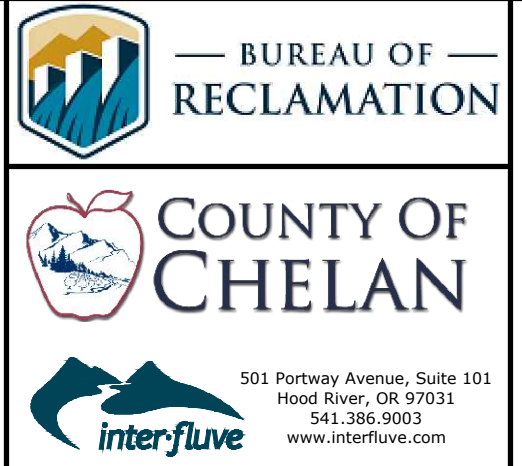
E. LARVAL LAMPREY ELECTROFISHING

- 1. PERMISSION FROM EC LEAD WILL BE OBTAINED IF LARVAL LAMPREY ELECTROFISHER IS NOT ONE OF FOLLOWING PRE-APPROVED MODELS: ABP-2 "WISCONSIN", SMITH-ROOT LR-24, OR SMITH-ROOT APEX BACKPACK.
2. LARVAL LAMPREY SAMPLING WILL INCORPORATE 2-STAGE METHOD: "TICKLE" AND "STUN".
3. FIRST STAGE: USE 125 VOLT DC WITH A 25 PERCENT DUTY CYCLE APPLIED AT A SLOW RATE OF 3 PULSES PER SECOND. IF TEMPERATURES ARE BELOW 10 DEGREES CELSIUS, VOLTAGE MAY BE INCREASED GRADUALLY (NOT TO EXCEED 200 VOLTS). BURSTED PULSES (THREE SLOW AND ONE SKIPPED) RECOMMENDED TO INCREASE EMERGENCE.
4. SECOND STAGE (OPTIONAL FOR EXPERIENCED NETTERS): IMMEDIATELY AFTER LAMPREY EMERGE, USE A FAST PULSE SETTING OF 30 PULSES PER SECOND.
5. USE DIP NETS FOR VISIBLE LAMPREY. SIENES AND FINE MESH NET SWEEPS MAY BE USED IN POOR VISIBILITY.
6. SAMPLING WILL OCCUR SLOWLY (>60 SECONDS PER METER) STARTING AT UPSTREAM AND WORKING DOWNSTREAM.
7. MULTIPLE SWEEPS TO OCCUR WITH 15 MINUTES BETWEEN SWEEPS.
8. POST-DRAWDOWN "DRY-SHOCKING" WILL BE APPLIED IF LARVAL LAMPREY CONTINUE TO EMERGE. ANODES TO BE PLACED ONE METER APART TO SAMPLE ONE SQUARE METER AT A TIME FOR AT LEAST 60 SECONDS. FOR TEMPERATURES LESS THAN 10 DEGREES CELSIUS, MAXIMUM VOLTAGE MAY BE GRADUALLY INCREASED TO 400 VOLTS (DRY-SHOCKING ONLY).

4. DEWATERING

- C. DEWATERING WILL OCCUR AT A RATE SLOW ENOUGH TO ALLOW SPECIES TO NATURALLY MIGRATE OUT OF THE WORK AREA.
D. WHERE A GRAVITY FEED DIVERSION IS NOT POSSIBLE, A PUMP MAY BE USED. PUMPS WILL BE INSTALLED TO AVOID REPETIVE DEWATERING AND REWATERING.
E. WHEN FISH ARE PRESENT, PUMPS WILL BE SCREENED IN ACCORDANCE WITH NMFS FISH SCREEN CRITERIA. NMFS ENGINEERING REVIEW AND APPROVAL WILL BE OBTAINED FOR PUMPS EXCEEDING 3 CUBIC FEET PER SECOND.
F. DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO THE STREAM CHANNEL AND RIPARIAN VEGETATION.
G. SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE OF INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL AND VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

CAD SYSTEM AutoCAD 2025 (LMS TECH) JPL LOWERCHIVAWA AREA_D.DWG LAST SAVED DATE 2024-10-18 LAST OWNED BY CROCCONWELL



ALWAYS THINK SAFETY U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION COLUMBIA PACIFIC NORTHWEST REGION FCRPS HABITAT IMPROVEMENT PROGRAM LOWER CHIVAWA ASSESSMENT UNIT PROJECT AREA D 30% DESIGN

Preliminary Not for Construction

CM DRAWN LS, PB ACCEPTED BOISE, ID OCTOBER 2024

HIP GENERAL CONSERVATION MEASURES (2 OF 3) SHEET 4

--- SHEET 4 OF 17



CONSTRUCTION AND POST CONSTRUCTION CONSERVATION MEASURES.

1. FISH PASSAGE

- A. FISH PASSAGE WILL BE PROVIDED FOR ADULT AND JUVENILE FISH LIKELY TO BE PRESENT DURING CONSTRUCTION UNLESS PASSAGE DID NOT EXIST BEFORE CONSTRUCTION, THE STREAM IS NATURALLY IMPASSABLE, OR PASSAGE WILL NEGATIVELY IMPACT ESA-LISTED SPECIES OR THEIR HABITAT.
B. FISH PASSAGE ALTERNATIVES WILL BE APPROVED UNDER ADVISEMENT BY THE NMFS HABITAT BIOLOGIST.

2. CONSTRUCTION AND DISCHARGE WATER

- A. SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.
B. DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.
C. CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS, AND OTHER POLLUTANTS.

3. TIME AND EXTENT OF DISTURBANCE

- A. EARTHWORK REQUIRING IN-STREAM MECHANIZED EQUIPMENT (INCLUDING DRILLING, EXCAVATION, DREDGING, FILLING, AND COMPACTING) WILL BE COMPLETED AS QUICKLY AS POSSIBLE.
B. MECHANIZED EQUIPMENT WILL WORK FROM TOP OF BANK UNLESS WORK FROM ANOTHER LOCATION WILL RESULT IN LESS HABITAT DISTURBANCE (TURBIDITY, VEGETATION DISTURBANCE, ETC.).

4. CESSATION OF WORK

- A. PROJECT OPERATIONS WILL CEASE WHEN HIGH FLOW CONDITIONS MAY RESULT IN INUNDATION OF THE PROJECT AREA (FLOOD EFFORTS TO DECREASE DAMAGES TO NATURAL RESOURCES PERMITTED).
B. WATER QUALITY LEVELS EXCEEDED. SEE CWA SECTION 401 WATER QUALITY CERTIFICATION AND TURBIDITY MEASURES.

5. SITE RESTORATION

- A. DISTURBED AREAS, STREAM BANKS, SOILS, AND VEGETATION WILL BE CLEANED UP AND RESTORED TO IMPROVED OR PRE-PROJECT CONDITIONS.
B. PROJECT-RELATED WASTE WILL BE REMOVED.
C. TEMPORARY ACCESS ROADS AND STAGING WILL BE DECOMPACTED AND RESTORED. SOILS WILL BE LOOSENED IF NEEDED FOR REVEGETATION OR WATER INFILTRATION.
D. THE PROJECT SPONSOR WILL RETAIN THE RIGHT OF REASONABLE ACCESS TO THE SITE TO MONITOR AND MAINTAIN THE SITE OVER THE LIFE OF THE PROJECT.

6. REVEGETATION

- A. PLANTING AND SEEDING WILL OCCUR PRIOR TO OR AT THE BEGINNING OF THE FIRST GROWING SEASON AFTER CONSTRUCTION.
B. A MIX OF NATIVE SPECIES (INVASIVE SPECIES NOT ALLOWED) APPROPRIATE TO THE SITE WILL BE USED TO REESTABLISH VEGETATION, PROVIDE SHADE, AND REDUCE EROSION. REESTABLISHED VEGETATION SHOULD BE AT LEAST 70% OF PRE-PROJECT CONDITIONS WITHIN THREE YEARS.
C. VEGETATION SUCH AS WILLOWS, SEDGES, OR RUSH MATS WILL BE SALVAGED FROM DISTURBED OR ABANDONED AREAS TO BE REPLANTED.
D. SHORT-TERM STABILIZATION MEASURE MAY INCLUDE THE USE OF NON-NATIVE STERILE SEED MIX (WHEN NATIVE NOT AVAILABLE), WEED-FREE CERTIFIED STRAW, OR OTHER SIMILAR TECHNIQUES.
E. SURFACE FERTILIZER WILL NOT BE APPLIED WITHIN 50 FEET OF ANY STREAM, WATE BODY, OR WETLAND.
F. FENCING WILL BE INSTALLED AS NECESSARY TO PREVENT ACCESS TO REVEGETATED SITES BY LIVESTOCK OR UNAUTHORIZED PERSONS.
G. INVASIVE PLANTS WILL BE REMOVED OR CONTROLLED UNTIL NATIVE PLANT SPECIES ARE WELL ESTABLISHED (TYPICALLY THREE YEARS POST-CONSTRUCTION).

7. SITE ACCESS AND IMPLEMENTATION MONITORING

- A. THE PROJECT SPONSOR WILL PROVIDE CONSTRUCTION MONITORING DURING IMPLEMENTATION TO ENSURE ALL CONSERVATION MEASURES ARE ADEQUATELY FOLLOWED, EFFECTS TO LISTED SPECIES ARE NOT GREATER THAN PREDICTED, AND INCIDENTAL TAKE LIMITATIONS ARE NOT EXCEEDED.
B. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL SUBMIT THE PROJECT COMPLETION FORM (PCF) WITHIN 30 DAYS OF PROJECT COMPLETION.

8. CWA SECTION 401 WATER QUALITY CERTIFICATION

- A. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL COMPLETE AND RECORD WATER QUALITY OBSERVATIONS (SEE TURBIDITY MONITORING) TO ENSURE IN-WATER WORK IS NOT DEGRADING WATER QUALITY.
B. DURING CONSTRUCTION, WATER QUALITY PROVISIONS PROVIDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WASHINGTON DEPARTMENT OF ECOLOGY.

STAGED REWATERING PLAN

- A. WHEN REINTRODUCING WATER TO DEWATERED AREAS AND NEWLY CONSTRUCTED CHANNELS, A STAGED REWATERING PLAN WILL BE APPLIED.
B. THE FOLLOWING WILL BE APPLIED TO ALL REWATERING EFFORTS. COMPLEX REWATERING EFFORTS MAY REQUIRE ADDITIONAL NOTES OR A DEDICATED SHEET IN THE CONSTRUCTION DETAILS.
1. TURBIDITY MONITORING PROTOCOL WILL BE APPLIED TO REWATERING EFFORTS.
2. PRE-WASH THE AREA BEFORE REWATERING. TURBID WASH WATER WILL BE DETAINED AND PUMPED TO THE FLOODPLAIN OR SEDIMENT CAPTURE AREAS RATHER THAN DISCHARGING TO FISH-BEARING STREAMS.
3. INSTALL SEINE NETS AT UPSTREAM END TO PREVENT FISH FROM MOVING DOWNSTREAM UNTIL 2/3 OF TOTAL FLOW IS RESTORED TO THE CHANNEL.
4. STARTING IN EARLY MORNING INTRODUCE 1/3 OF NEW CHANNEL FLOW OVER PERIOD OF 1-2 HOURS.
5. INTRODUCE SECOND THIRD OF FLOW OVER NEXT 1 TO 2 HOURS AND BEGIN FISH SALVAGE OF BYPASS CHANNEL IF FISH ARE PRESENT.
6. REMOVE UPSTREAM SEINE NETS ONCE 2/3 FLOW IN REWATERED CHANNEL AND DOWNSTREAM TURBIDITY IS WITHIN ACCEPTABLE RANGE (LESS THAN 40 NTU OR LESS THAN 10% BACKGROUND).
7. INTRODUCE FINAL THIRD OF FLOW ONCE FISH SALVAGE EFFORTS ARE COMPLETE AND DOWNSTREAM TURBIDITY VERIFIED TO BE WITHIN ACCEPTABLE RANGE.
8. INSTALL PLUG TO BLOCK FLOW INTO OLD CHANNEL OR BYPASS. REMOVE ANY REMAINING SEINE NETS.
9. IN LAMPREY SYSTEMS, LAMPREY SALVAGE AND DRY SHOCKING MAY BE NECESSARY.

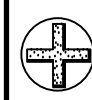
TURBIDITY MONITORING

- A. RECORD THE READING, LOCATION, AND TIME FOR THE BACKGROUND READING APPROXIMATELY 100 FEET UPSTREAM OF THE PROJECT AREA USING A RECENTLY CALIBRATED TURBIDIMETER OR VIA VISUAL OBSERVATION (SEE THE HIP HANDBOOK TURBIDITY MONITORING SECTION FOR A VISUAL OBSERVATION KEY).
B. RECORD THE TURBIDITY READING, LOCATION, AND TIME AT THE MEASUREMENT COMPLIANCE LOCATION POINT.
1. 50 FEET DOWNSTREAM FOR STREAMS LESS THAN 30 FEET WIDE.
2. 100 FEET DOWNSTREAM FOR STREAMS BETWEEN 30 AND 100 FEET WIDE.
3. 200 FEET DOWNSTREAM FOR STREAMS GREATER THAN 100 FEET WIDE.
4. 300 FEET FROM THE DISCHARGE POINT OR NONPOINT SOURCE FOR LOCATIONS SUBJECT TO TIDAL OR COASTAL SCOUR.
C. TURBIDITY SHALL BE MEASURED (BACKGROUND LOCATION AND COMPLIANCE POINTS) EVERY 4 HOURS WHILE WORK IS BEING IMPLEMENTED.
D. IF THERE IS A VISIBLE DIFFERENCE BETWEEN A COMPLIANCE POINT AND THE BACKGROUND, THE EXCEEDANCE WILL BE NOTED IN THE PROJECT COMPLETION FORM (PCF). ADJUSTMENTS OR CORRECTIVE MEASURES WILL BE TAKEN IN ORDER TO REDUCE TURBIDITY.
E. IF EXCEEDANCES OCCUR FOR MORE THAN TWO CONSECUTIVE MONITORING INTERVALS (AFTER 8 HOURS), THE ACTIVITY WILL STOP UNTIL THE TURBIDITY LEVEL RETURNS TO BACKGROUND. THE EC LEAD WILL BE NOTIFIED OF ALL EXCEEDANCES AND CORRECTIVE ACTIONS AT PROJECT COMPLETION.
F. IF TURBIDITY CONTROLS (COFFER DAMS, WADDLES, FENCING, ETC.) ARE DETERMINED INEFFECTIVE, CREWS WILL BE MOBILIZED TO MODIFY AS NECESSARY. OCCURRENCES WILL BE DOCUMENTED IN THE PROJECT COMPLETION FORM (PCF).
G. FINAL TURBIDITY READINGS, EXCEEDANCES, AND CONTROL FAILURES WILL BE SUBMITTED TO THE EC LEAD USING THE PROJECT COMPLETION FORM (PCF).

LAST SAVED DATE 2024-10-18 10:18 AM DRAWN BY UNCCORRELL

CAD SYSTEM AutoCAD 2024 (LMS TECH) 10/18/2024 10:18 AM IFL LOWERCHIVAWA AREA_D.DWG

ALWAYS THINK SAFETY



U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION COLUMBIA PACIFIC NORTHWEST REGION FCRPS HABITAT IMPROVEMENT PROGRAM

LOWER CHIWAWA ASSESSMENT UNIT PROJECT AREA D 30% DESIGN

Preliminary Not for Construction

CM DRAWN

LS_PB ACCEPTED

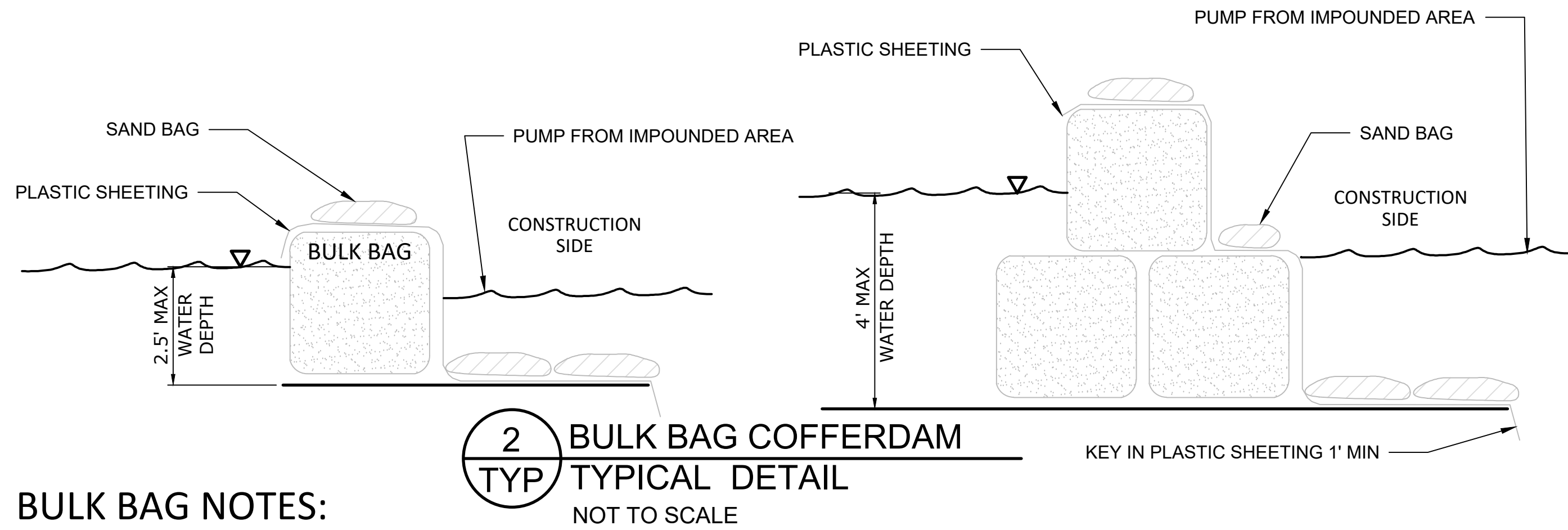
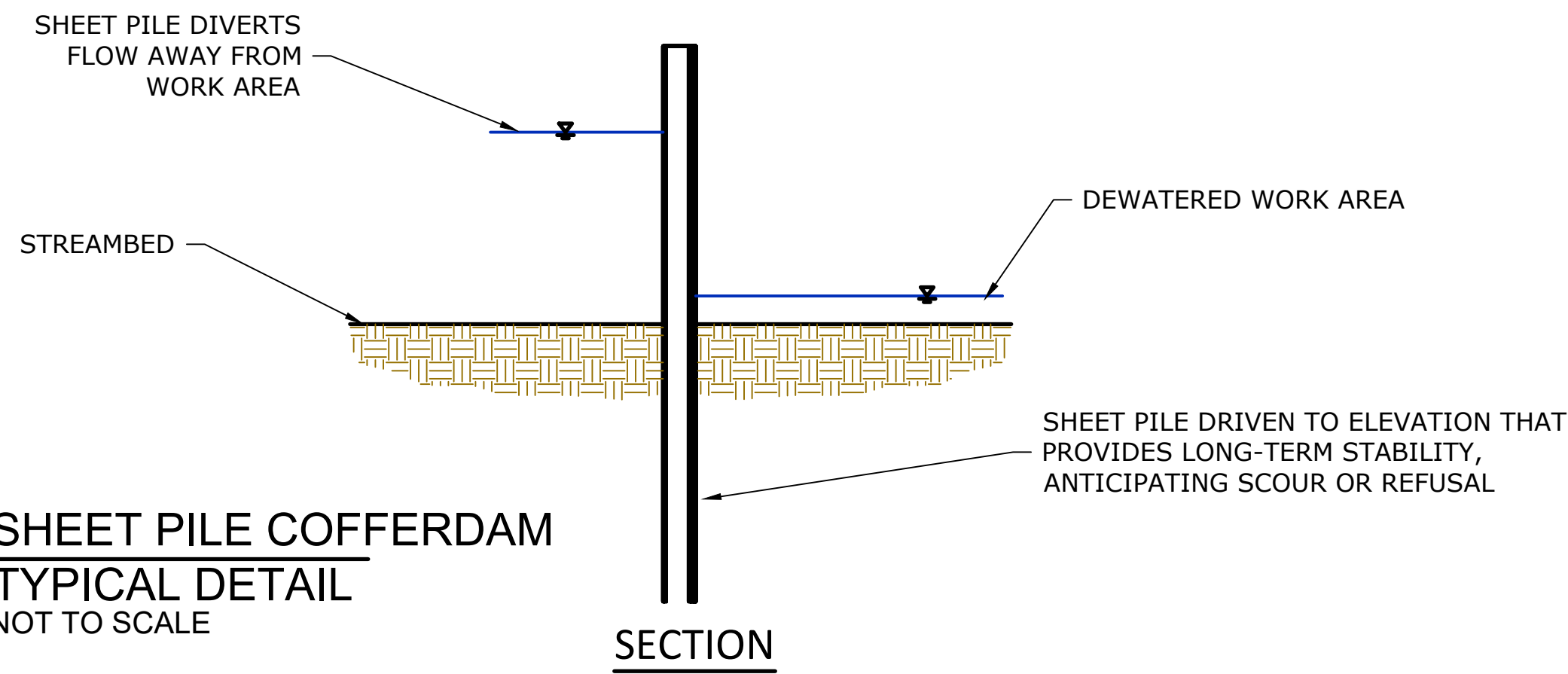
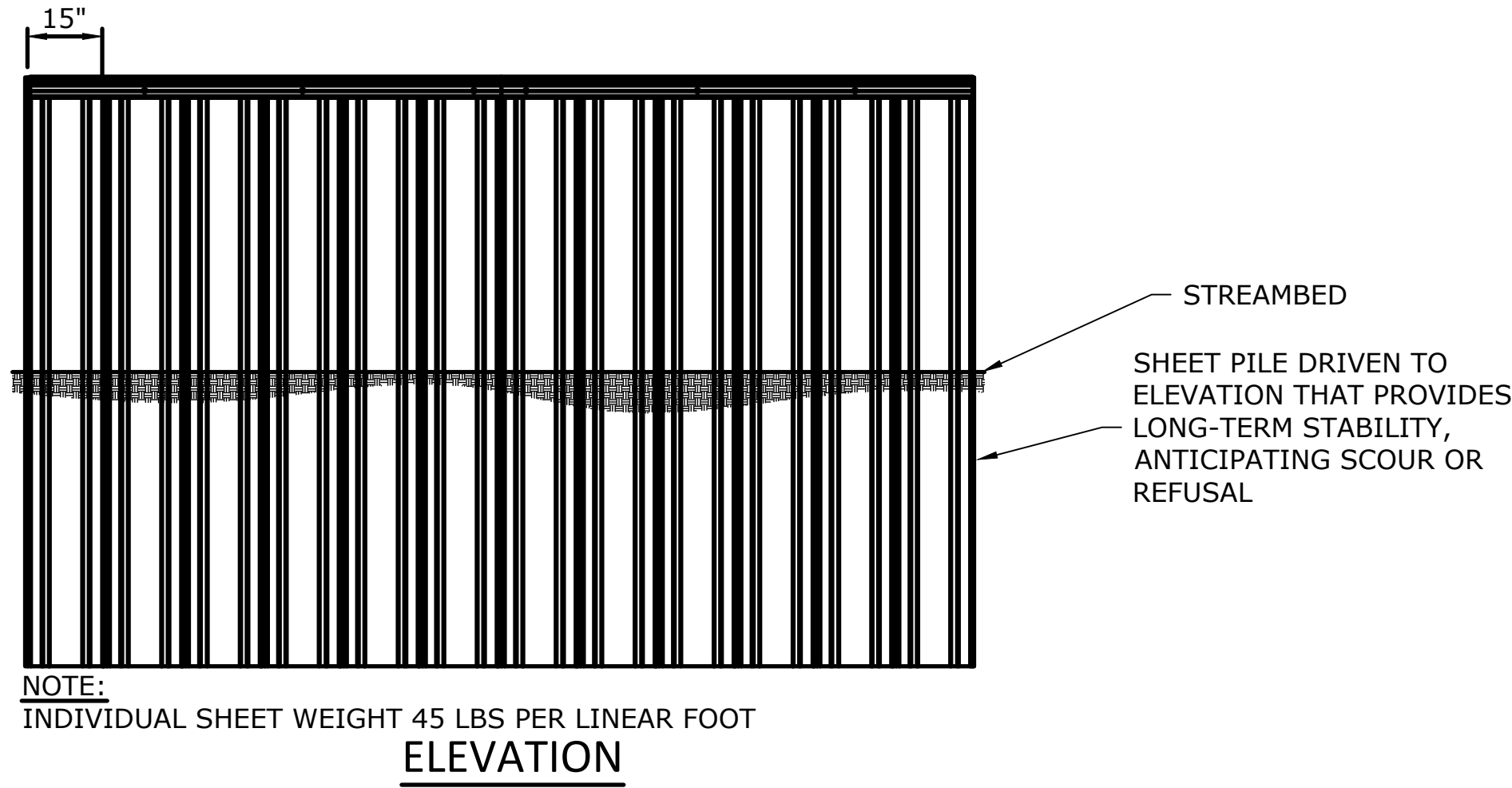
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OCTOBER 2024

HIP GENERAL CONSERVATION MEASURES (3 OF 3)

SHEET 5

SHEET 5 OF 17



BULK BAG NOTES:

1. BULK BAG COFFERDAM SHALL BE CONSTRUCTED OF SEVERAL UNITS OF BULK BAGS FILLED WITH WASHED GRAVEL, AND ABUTTED SIDE BY SIDE TO CREATE A ROW THAT ISOLATES THE CONSTRUCTION SITE.
2. IF WATER DEPTH EXCEEDS 85% OF THE BULK BAG HEIGHT, AN ADDITIONAL TOP ROW OF BULK BAGS SHALL BE INSTALLED, SUPPORTED BY TWO BOTTOM ROWS OF BULK BAGS. BULK BAG COFFERDAM SHALL BE SEALED BY COVERING THE COFFERDAM WITH PLASTIC SHEETING HELD IN PLACE BY STANDARD SANDBAGS PLACED IN ROWS ON TOP OF COFFERDAM, AND AT TOE OF COFFERDAM.
3. THE PLASTIC SHEETING SHALL BE DRAPED ALONG THE CHANNEL BOTTOM ON BOTH SIDES OF THE COFFERDAM WITH OUTWARD EDGE OF SHEETING MINIMUM 4- FEET FROM TOE OF COFFERDAM. THE DRAPED PORTION OF PLASTIC SHEETING SHALL BE PINNED TO THE CHANNEL BED BY MINIMUM TWO ROWS OF STANDARD SANDBAGS.
4. THE CONSTRUCTION SIDE EDGE OF PLASTIC SHEETING SHALL BE TOED INTO THE CHANNEL BED MINIMUM 1-FT. TOEING IN THE OUTWARD EDGE OF PLASTIC SHEETING SHALL OCCUR AFTER THE COFFERDAM IS CLOSED TO PREVENT TURBIDITY RELEASE TO THE WATERWAY.
5. THE TERMINAL ENDS OF BULK BAG COFFERDAM, WHERE IT CONNECTS TO CHANNEL BANK OR HIGH GROUND, SHALL BE SEALED WITH PLASTIC SHEETING AND STANDARD SANDBAGS.
6. BULK BAGS SHALL BE CUBE-SHAPED POLYPROPYLENE WOVEN FABRIC BAGS WITH FULLY OPEN TOP, FLAT BOTTOM, FOUR LOOPS, MINIMUM 2-TON WEIGHT CAPACITY, MINIMUM 5:1 SAFETY FACTOR.
7. PLASTIC SHEETING SHALL BE MINIMUM 6-MIL THICKNESS. ROLL LENGTH SHALL BE LONG ENOUGH TO ENSURE THAT ENTIRE LENGTH OF COFFERDAM WILL BE COVERED WITHOUT A SEAM. MINIMUM 12-FT WIDE ROLL SHALL BE USED FOR SINGLE LAYER BULK BAG COFFERDAM. MINIMUM 16-FT WIDE ROLL SHALL BE USED FOR 2-LAYER STACKED BULK BAG COFFERDAM.
8. BULK BAG COFFERDAM SHALL BE COMPLETELY REMOVED AFTER CONSTRUCTION IS COMPLETED AND TURBIDITY HAS BEEN REMOVED.
9. ALTERNATE COFFERDAM MATERIALS AND CONFIGURATIONS MAY BE ALLOWED BUT SHALL NOT BE IMPLEMENTED WITHOUT REVIEW AND APPROVAL BY THE OWNER'S REPRESENTATIVE. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS AND/OR VENDOR CUT SHEETS FOR SUBSTITUTIONS.

TEMPORARY COFFERDAM NOTES:

1. TEMPORARY SHEET PILE AND BULK BAGS ARE PRE-APPROVED METHODS OF ISOLATING CONSTRUCTION WATER FROM THE WATERWAY. SHEET PILE COFFERDAM IS THE PREFERRED ISOLATION METHOD. ALTERNATIVE METHODS PROPOSED BY THE CONTRACTOR MAY BE UTILIZED WITH APPROVAL BY THE OWNER.
2. CONTRACTOR SHALL PROVIDE PUMPING SUFFICIENT FOR A NET INFLOW TO THE WORK AREA, AND DISCHARGE TURBID WATER TO UPLAND FLOODPLAIN.
3. COFFERDAM SHALL BE COMPLETELY REMOVED AFTER CONSTRUCTION IS COMPLETED AND TURBIDITY HAS BEEN REMOVED.

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CAD SYSTEM
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 PROJECT AREA D
 30% DESIGN

Preliminary
Not for Construction

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LS, PB
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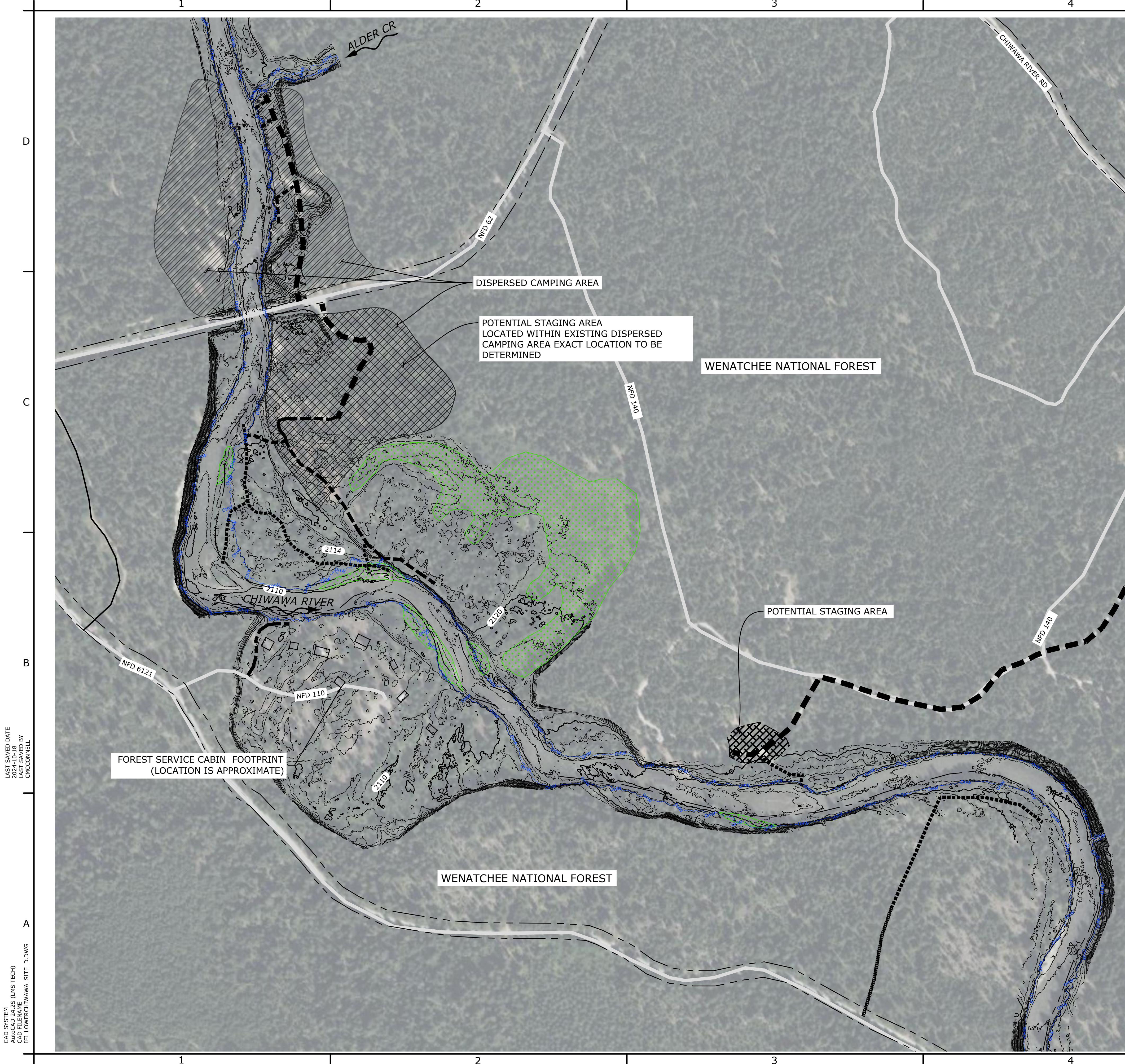
BOISE, ID

OCTOBER 2024

TYPICAL SEDIMENT CONTROL DETAIL

SHEET 6

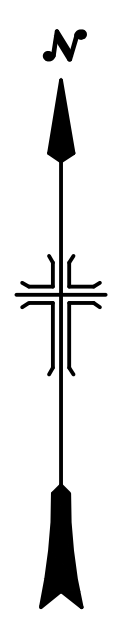
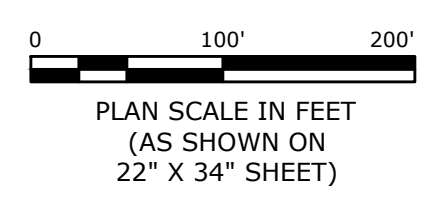
SHEET 6 OF 17



- NOTES:**
1. ALL TEMPORARY ACCESS ROUTES SHALL AVOID EXISTING MATURE TREES WHERE FEASIBLE.
 2. PARCEL BOUNDARY INFORMATION IS APPROXIMATE
 3. DEPICTED ACCESS ROUTES ARE APPROXIMATE AND WILL NEED TO BE COORDINATED WITH LANDOWNERS.

LEGEND

- EXISTING CONTOURS (1')
- EXISTING CONTOURS (5')
- TAXLOTS
- POTENTIAL ACCESS ROUTE - USE EXISTING
- POTENTIAL ACCESS ROUTE - REPURPOSE FORMER
- POTENTIAL ACCESS ROUTE - PIONEER NEW
- ALIGNMENT
- POTENTIAL STAGING AREA
- DISPERSED CAMPING AREA
- WETLANDS (INTER-FLUVE 2023)
- ORDINARY HIGH WATER



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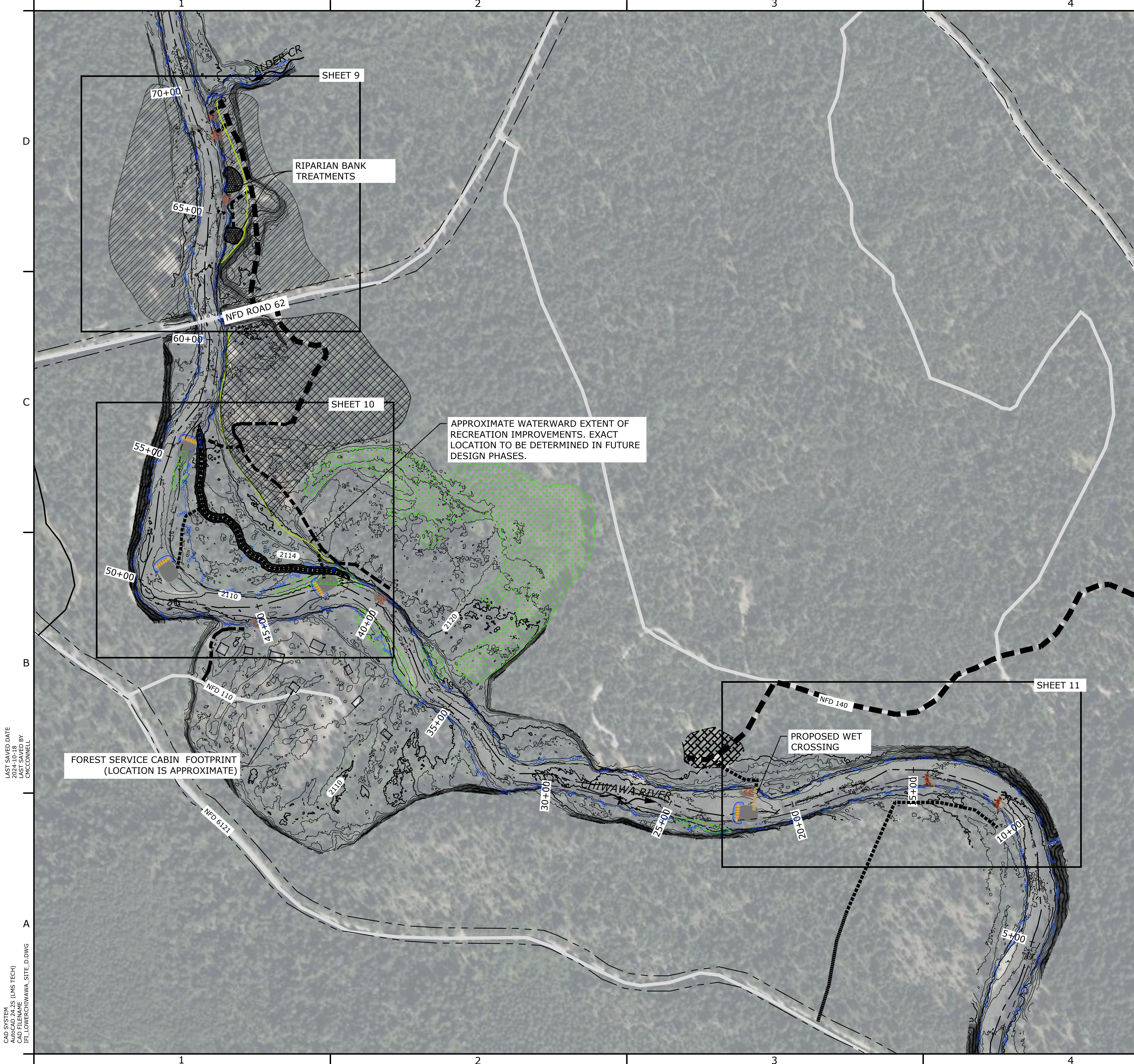
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EXISTING CONDITIONS,
 ACCESS AND STAGING

SHEET 7

 SHEET 7 OF 17

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 LAST DRAWN BY: GREGG WELLS
 FILE: JFL_LOWERCHIWAWA_SITE_D.DWG



- NOTES:**
1. LARGE WOOD LAYOUT, LOCATIONS, AND ORIENTATIONS ARE APPROXIMATE AND WILL VARY DEPENDING ON SITE CONDITIONS AND THE DIMENSIONS OF WOOD RECEIVED. ADDITIONAL DESIGN WILL BE REQUIRED TO DETERMINE THE EXACT LOCATIONS AND SIZES OF STRUCTURES.
 2. LARGE WOOD PLACEMENTS SHALL UTILIZE EXISTING BOULDERS IN THE CHANNEL TO THE EXTENT PRACTICABLE.
 3. ALL TEMPORARY ACCESS ROUTES SHALL AVOID EXISTING MATURE TREES WHERE FEASIBLE.
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 6. SIDE CHANNEL CONNECTIONS WERE TARGETED FOR ENGAGEMENT AT BASEFLOWS (SEPTEMBER AVERAGE FLOW) WHERE FEASIBLE BASED ON PRELIMINARY HYDRAULIC MODEL RESULTS.
 7. RECREATIONAL DESIGN FOR DECOMMISSIONED CAMPGROUND AREAS TO BE COMPLETED BY OTHERS.

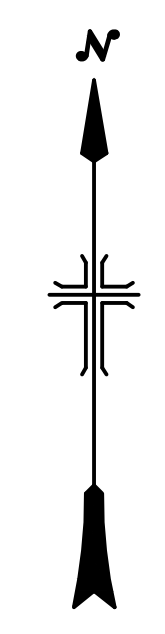
LEGEND

- EXISTING CONTOURS (2')
- EXISTING CONTOURS (10')
- PROPOSED CONTOURS (1')
- TAXLOTS
- POTENTIAL ACCESS ROUTE - USE EXISTING
- POTENTIAL ACCESS ROUTE - REPURPOSE FORMER
- POTENTIAL ACCESS ROUTE - PIONEER NEW
- ALIGNMENT
- LARGE WOOD STRUCTURE (TYPE VARIES)
- POTENTIAL STAGING AREA
- DECOMMISSION DISPERSED CAMPING
- WETLANDS (INTER-FLUVE 2023)
- OHW
- APPROXIMATE EXTENT OF RECREATION IMPROVEMENTS

000+00

PLAN SCALE IN FEET (AS SHOWN ON 22" X 34" SHEET)

0 100' 200'

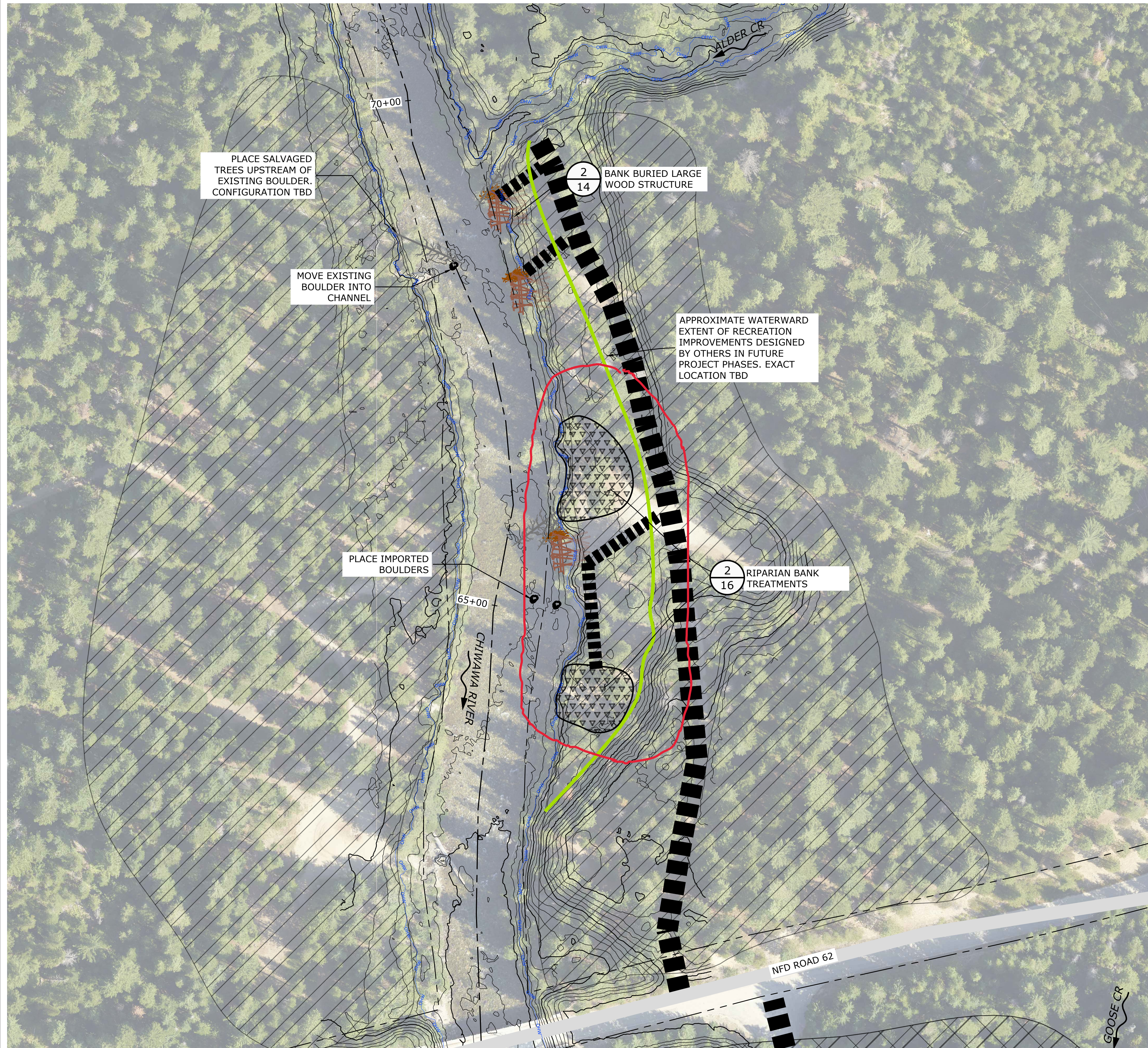


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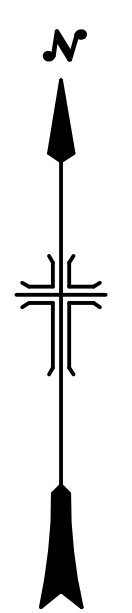
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 - RECREATIONAL DESIGN FOR DECOMMISSIONED CAMPGROUND AREAS TO BE COMPLETED BY OTHERS IN FUTURE PROJECT PHASES.

LEGEND

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- POTENTIAL ACCESS ROUTE - PIONEER NEW
- ALIGNMENT
- 000+00
- LARGE WOOD STRUCTURE (TYPE VARIES)
- POTENTIAL STAGING AREA
- RIPARIAN BANK TREATMENTS
- DECOMMISSION DISPERSED CAMPING
- ORDINARY HIGH WATER
- APPROXIMATE EXTENT OF RECREATION IMPROVEMENTS

PLAN SCALE IN FEET (AS SHOWN ON 22" X 34" SHEET)

0 50' 100'



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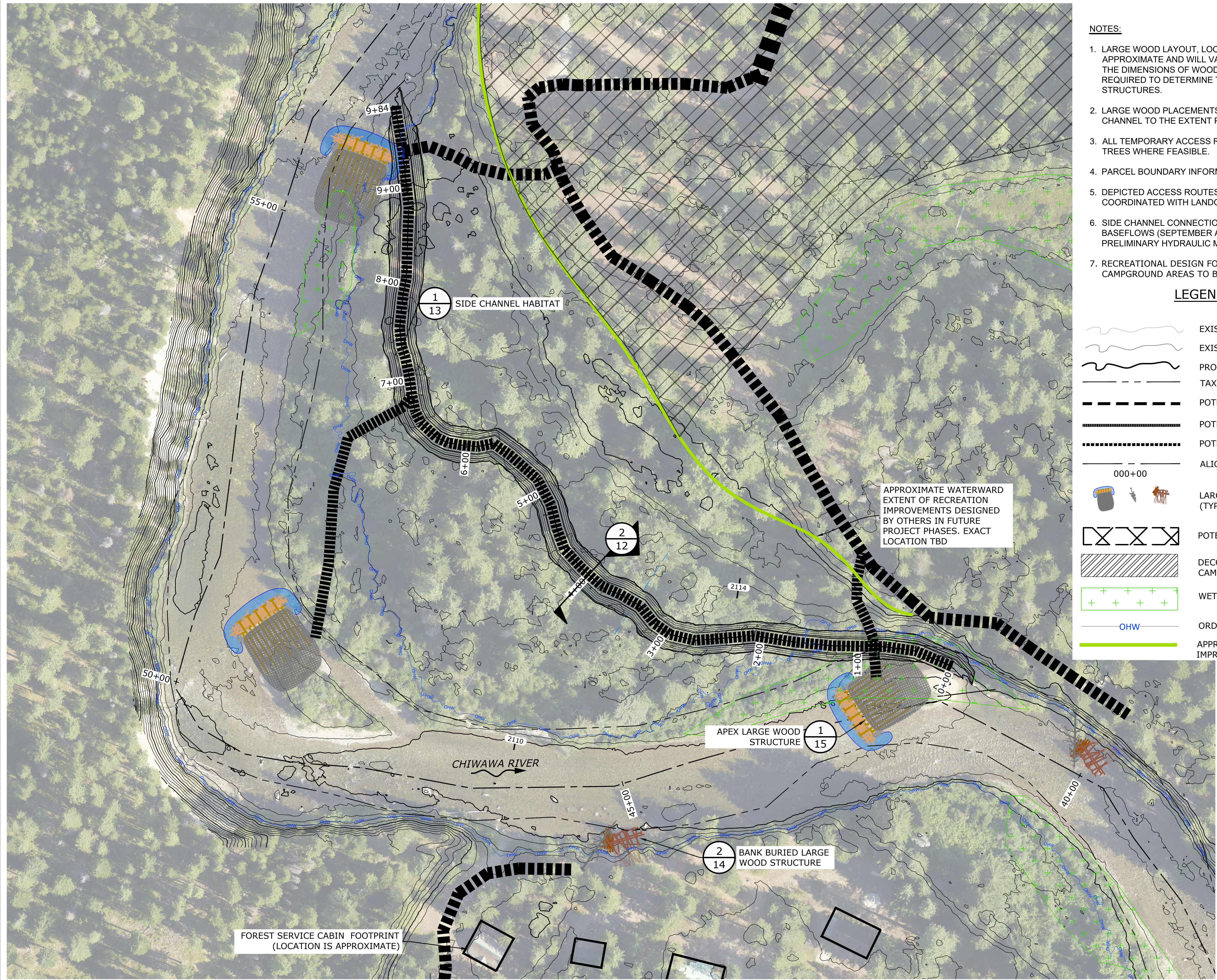
PROPOSED CONDITIONS
 (1 OF 3)
 SHEET 9
 SHEET 9 OF 17

NOTES:

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- ALIGNMENT
- 000+00
- LARGE WOOD STRUCTURE (TYPE VARIES)
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- DECOMMISSION DISPERSED CAMPING
- WETLANDS (INTER-FLUVE 2023)
- ORDINARY HIGH WATER
- APPROXIMATE EXTENT OF RECREATION IMPROVEMENTS



APPROXIMATE WATERWARD EXTENT OF RECREATION IMPROVEMENTS DESIGNED BY OTHERS IN FUTURE PROJECT PHASES. EXACT LOCATION TBD

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LOWER CHIWAHA ASSESSMENT UNIT
PROJECT DEVELOPMENT
30% DESIGN

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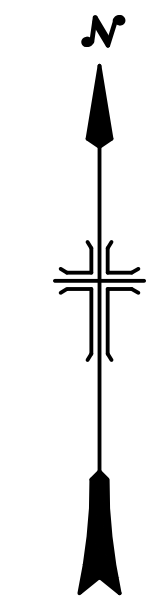
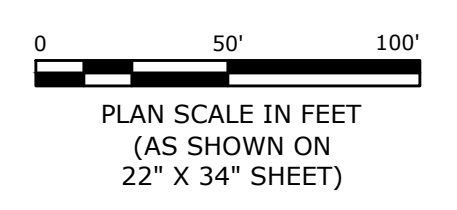
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PROPOSED CONDITIONS (2 OF 3)
SHEET 10

SHEET 10 OF 17

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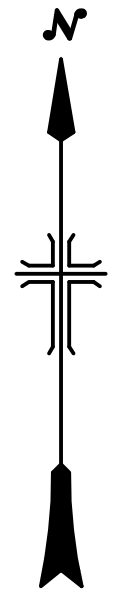
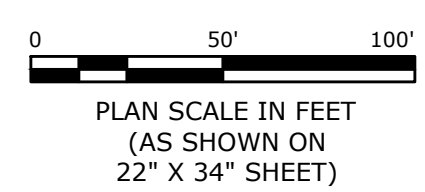
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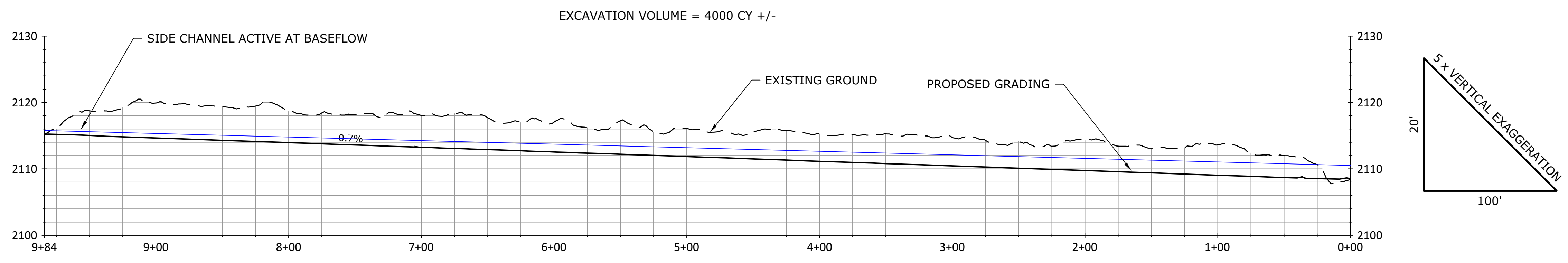
LEGEND	
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	EXISTING CONTOURS (10')
	TAXLOTS
	POTENTIAL ACCESS ROUTE - USE EXISTING
	POTENTIAL ACCESS ROUTE - REPURPOSE FORMER
	POTENTIAL ACCESS ROUTE - PIONEER NEW
	ALIGNMENT
	ALIGNMENT
	LARGE WOOD STRUCTURE (TYPE VARIES)
	POTENTIAL STAGING AREA
	WETLANDS (INTER-FLUVE 2023)
	ORDINARY HIGH WATER



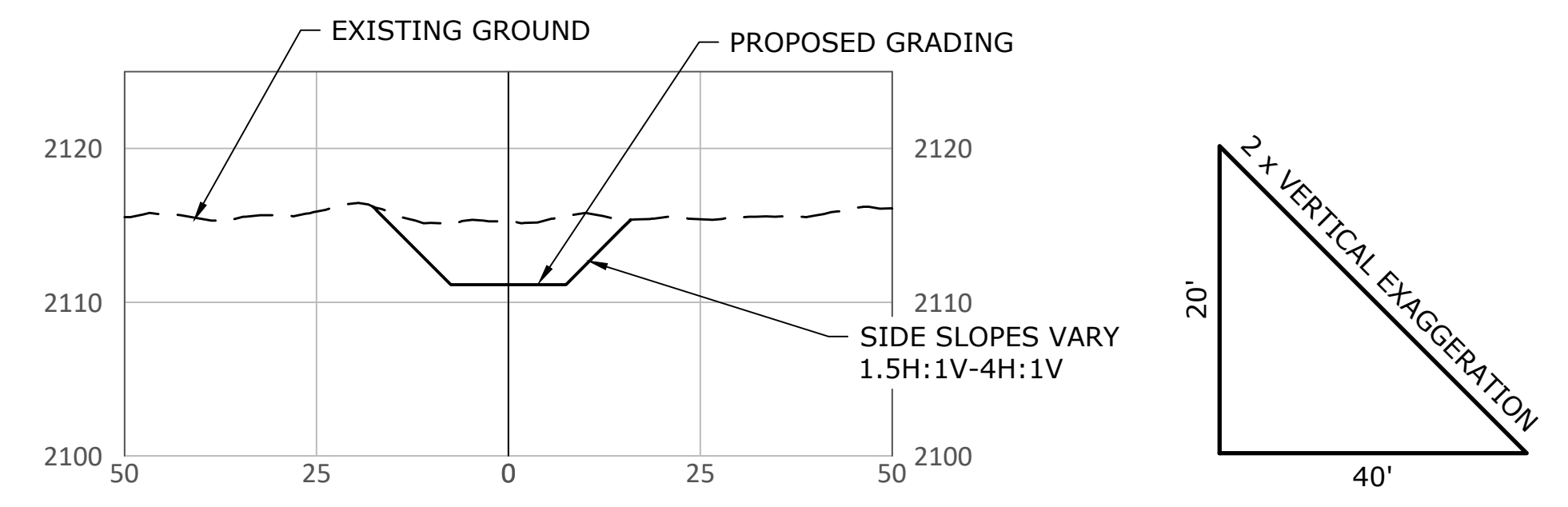
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 BOISE, ID OCTOBER 2024

PROPOSED CONDITIONS
 (3 OF 3)
 SHEET 11
 SHEET 11 OF 17



1
12 SIDE CHANNEL PROFILE
NOT TO SCALE



2
12 TYPICAL SIDE CHANNEL CROSS SECTION
NOT TO SCALE

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 CAD SYSTEM: AutoCAD 2025 (LMS TECH)
 FILE: JFL_LOWERCHIWAWA_SITE.DWG

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 FCRRS HABITAT IMPROVEMENT PROGRAM
LOWER CHIWAWA ASSESSMENT UNIT
PROJECT AREA D
 30% DESIGN

Preliminary
 Not for Construction

CM
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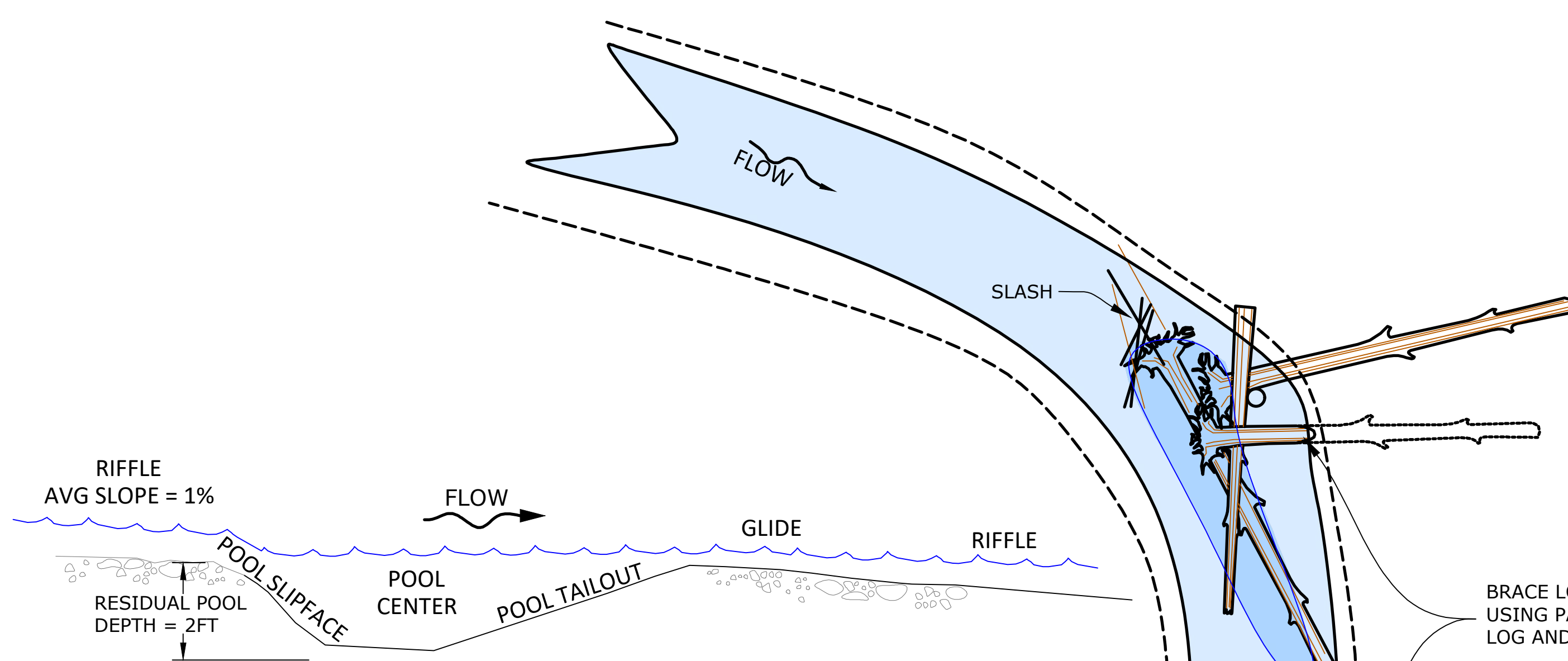
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SIDE CHANNEL PROFILE
AND CROSS SECTION

SHEET 12

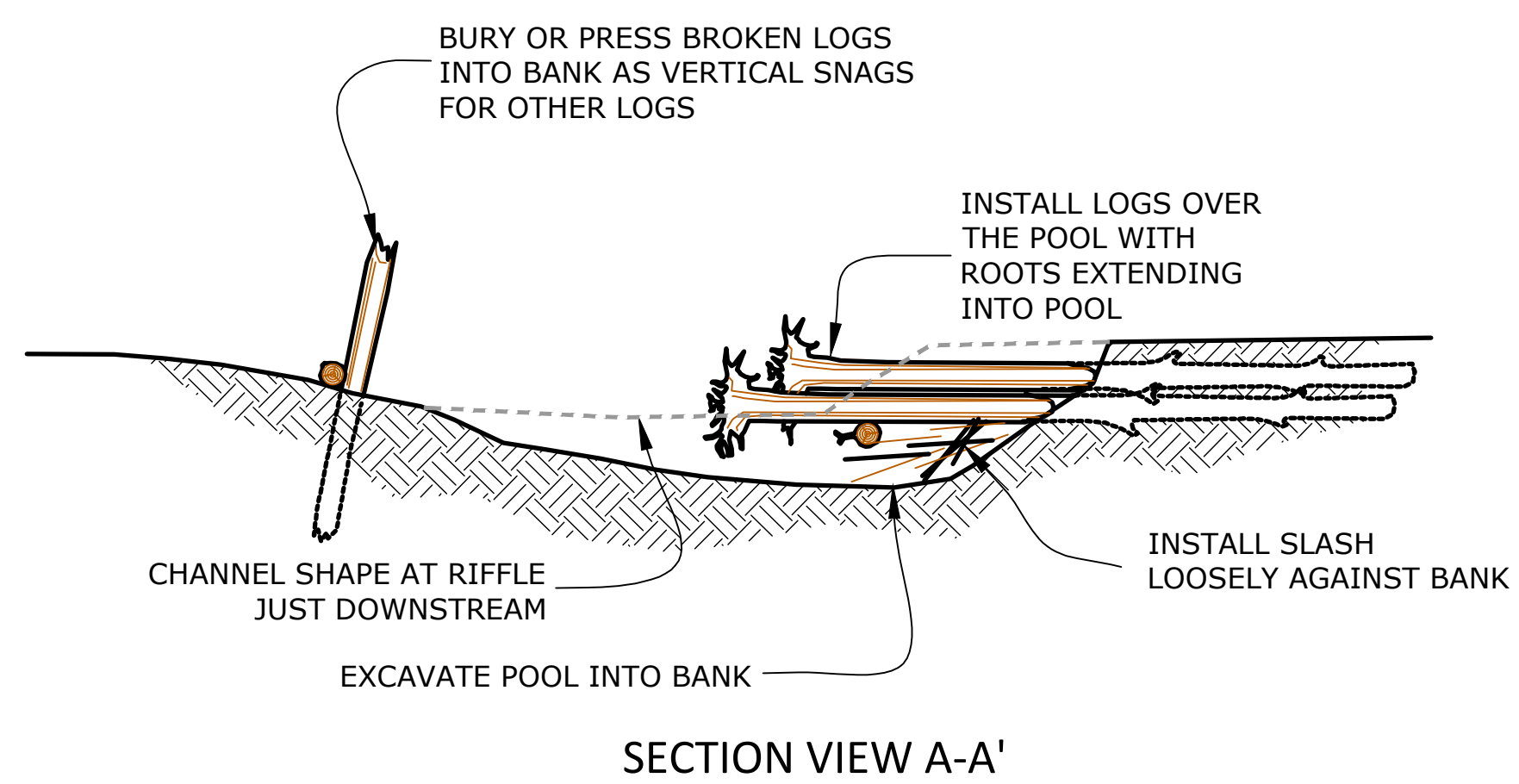
SHEET 12 OF 17



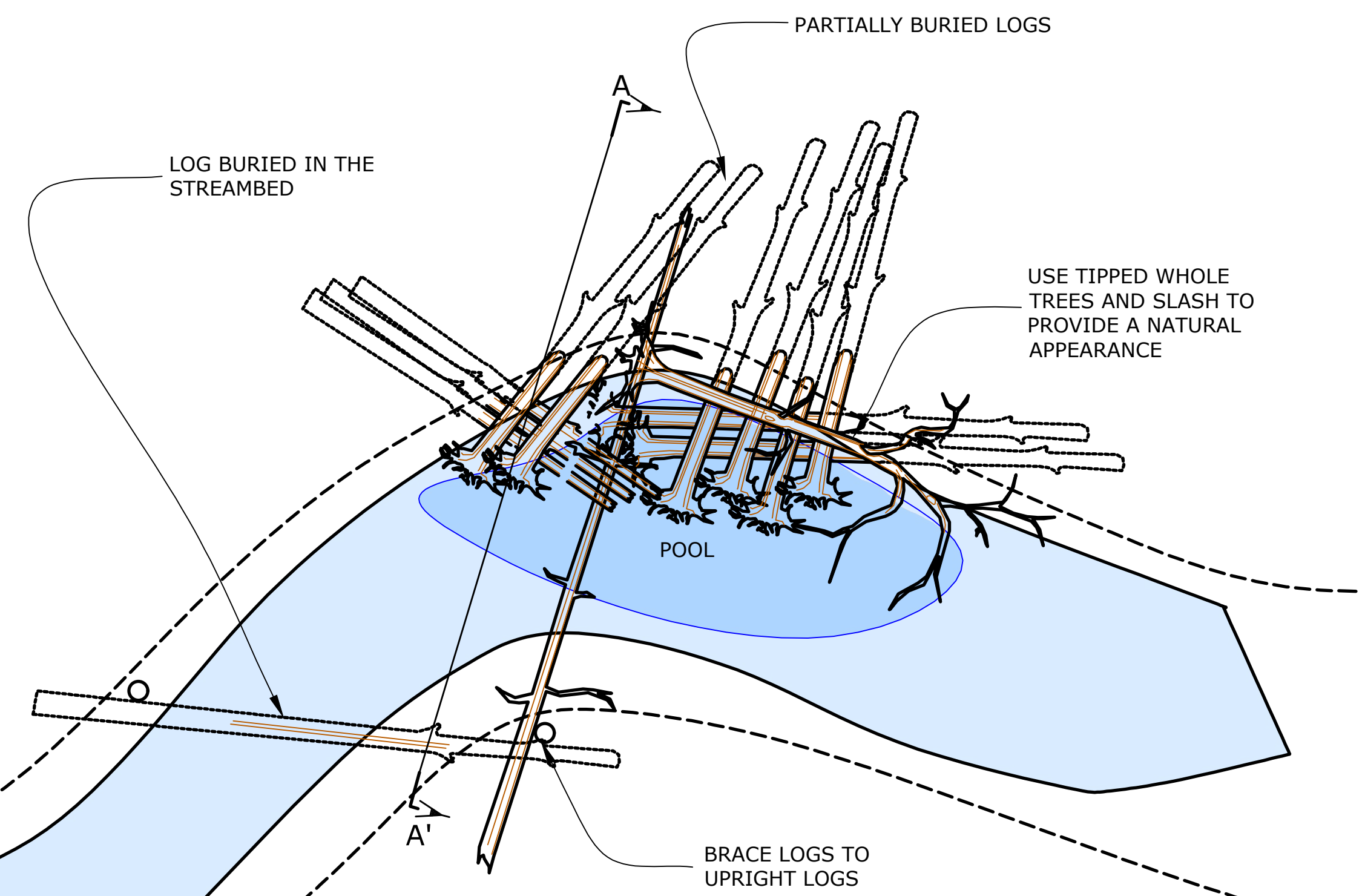
PROFILE VIEW - TYPICAL RIFFLE-POOL SEQUENCE
 NOT TO SCALE

NOTES:

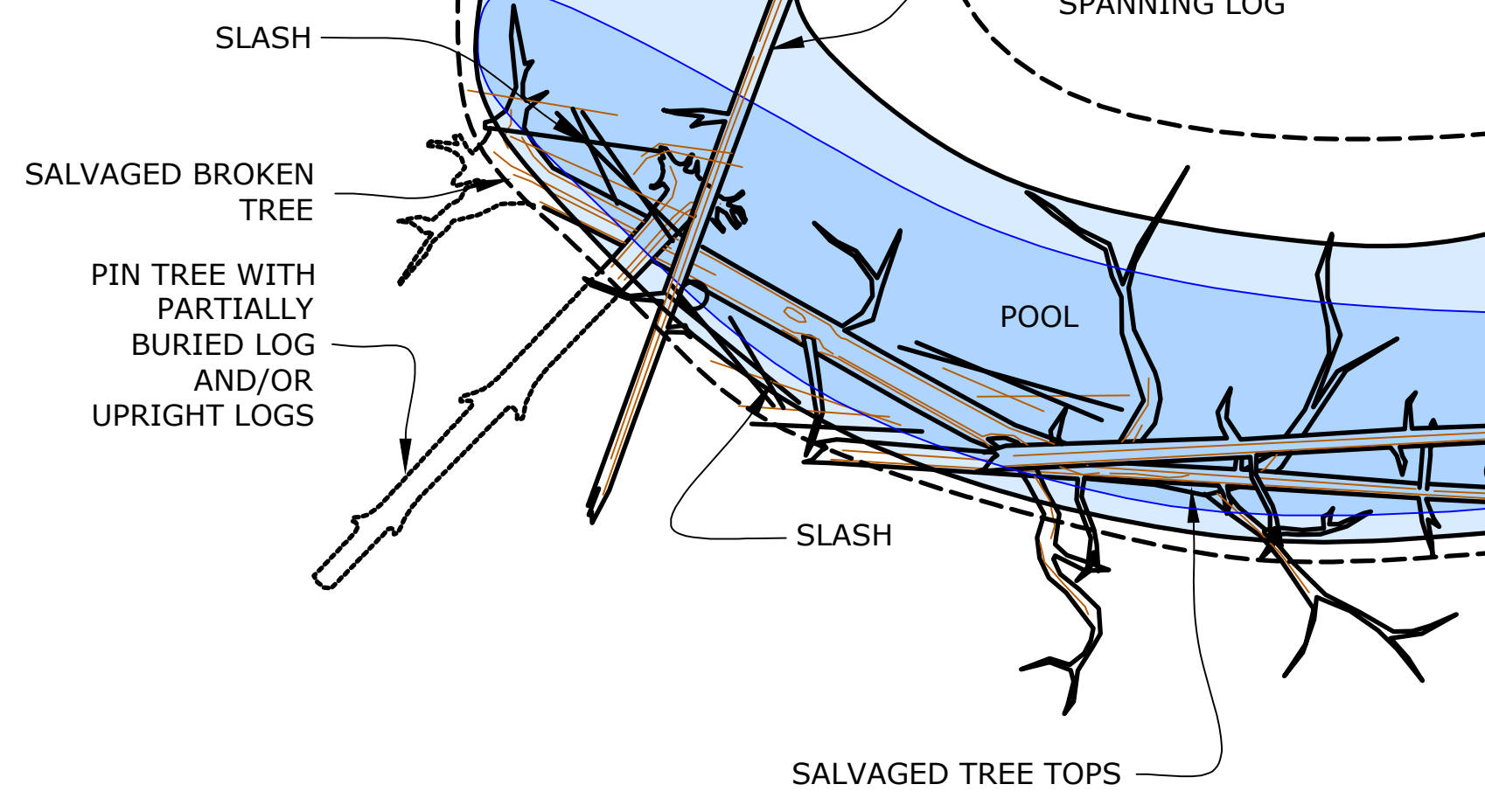
1. TREES AND SHRUBS WITHIN CLEARING LIMITS SHALL BE SALVAGED AND REUSED AS LOGS AND SLASH IN HABITAT STRUCTURES. TO THE EXTENT PRACTICABLE, PRESERVE BRANCHES AND ROOTS ON TREES REMOVED DURING CLEARING AND GRUBBING.
2. WOOD STRUCTURES SHALL BE STABILIZED. STABILIZATION METHODS INCLUDE PARTIAL BURIAL, BRACING AGAINST STANDING TREES, OR VERTICAL SNAGS.



WOOD CONFIGURATION AND POOL ENHANCEMENT
 NOT TO SCALE



1
13 TYPICAL SIDE CHANNEL HABITAT
 NOT TO SCALE



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 FILE: JFL_LOWERCHIVAWA-D_DETAILS.DWG

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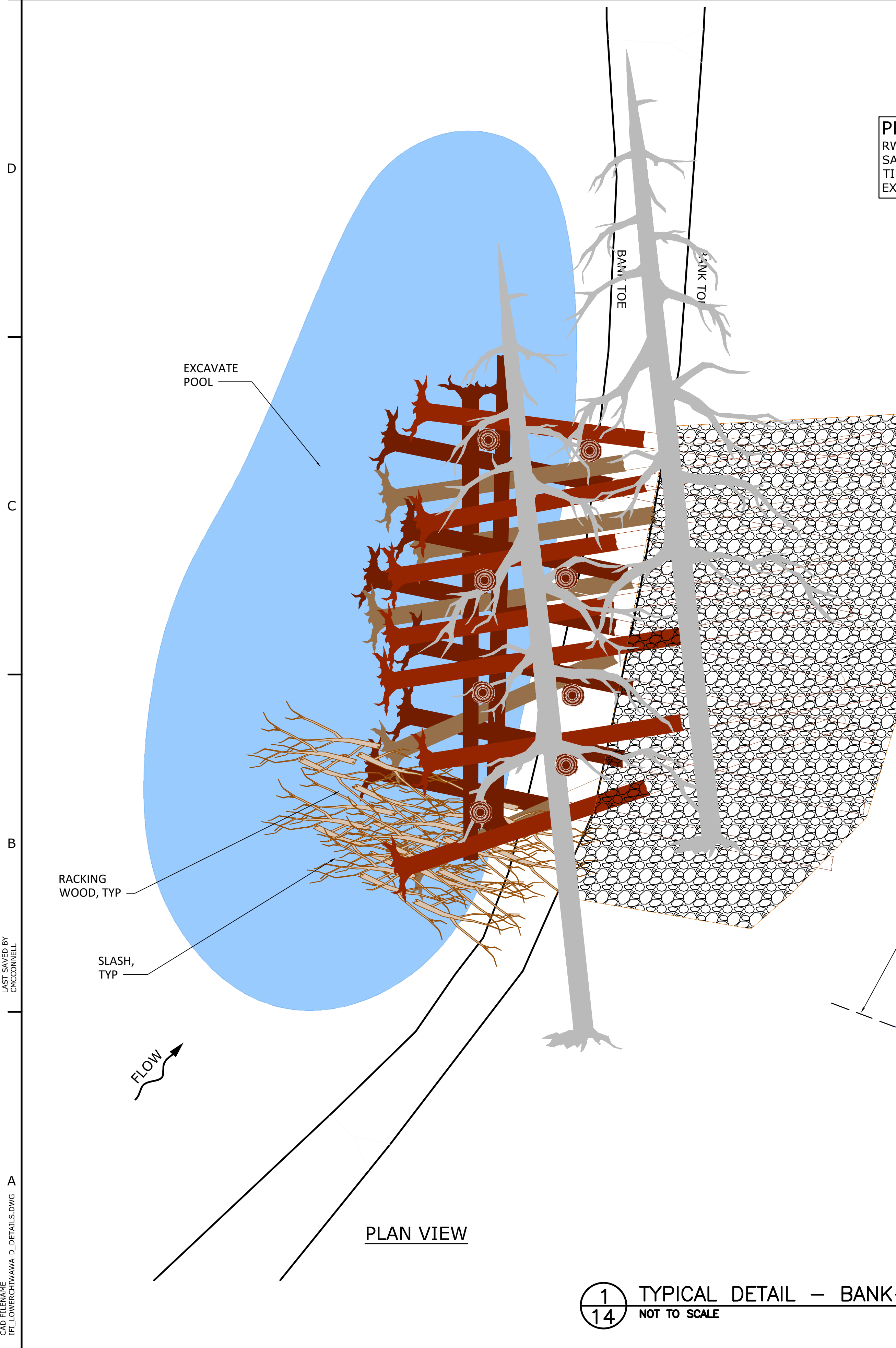
TYPICAL DETAILS (1 OF 5)

SHEET 13

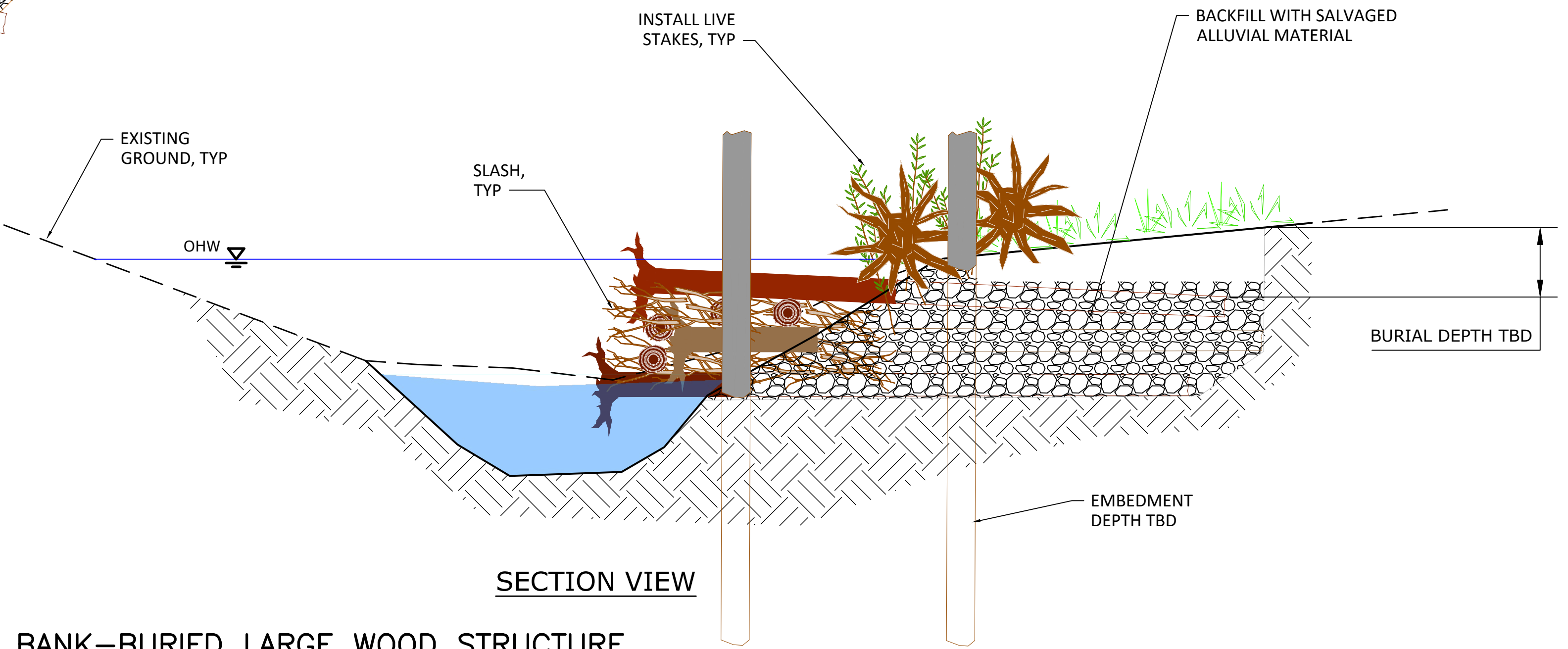
SHEET 13 OF 17

PRELIMINARY QUANTITIES
 RW LOGS: 20
 SALVAGED WHOLE TREES: 2
 TIMBER PILES: 8
 EXCAVATED QUANTITIES: TBD

- NOTES:**
1. LARGE WOOD DETAILS ARE TYPICAL. SIZE, EXTENT, AND NUMBER OF LOGS TO BE REFINED IN SUBSEQUENT DESIGN PHASES.
 2. PILES OR BOULDER BALLAST MAY BE USED IN INSTANCES WHERE MINIMUM BURIAL DEPTH CANNOT BE ACHIEVED.



TYPICAL CONSTRUCTED BANK-BURIED LARGE WOOD STRUCTURE



1
14
TYPICAL DETAIL – BANK-BURIED LARGE WOOD STRUCTURE
NOT TO SCALE

LAST SAVED DATE: 2024-10-18
 LAST DRAWN BY: GREGG WELLS
 LAST CHECKED BY: GREGG WELLS
 CAD SYSTEM: AutoCAD 2025 (LMS TECH)
 FILE: JFL_LOWERCHIVAWA-D_DETAILS.DWG

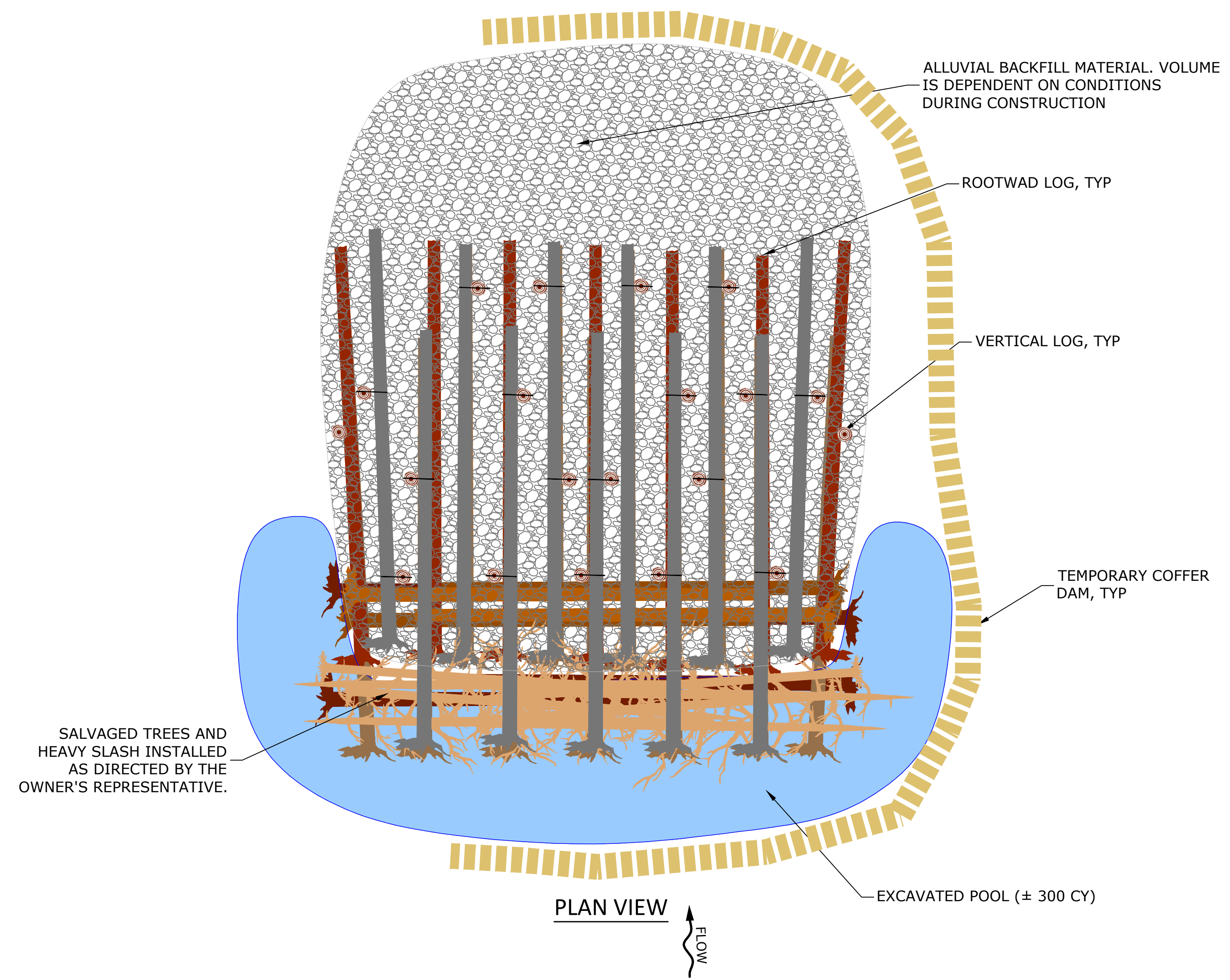
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 PROJECT AREA D
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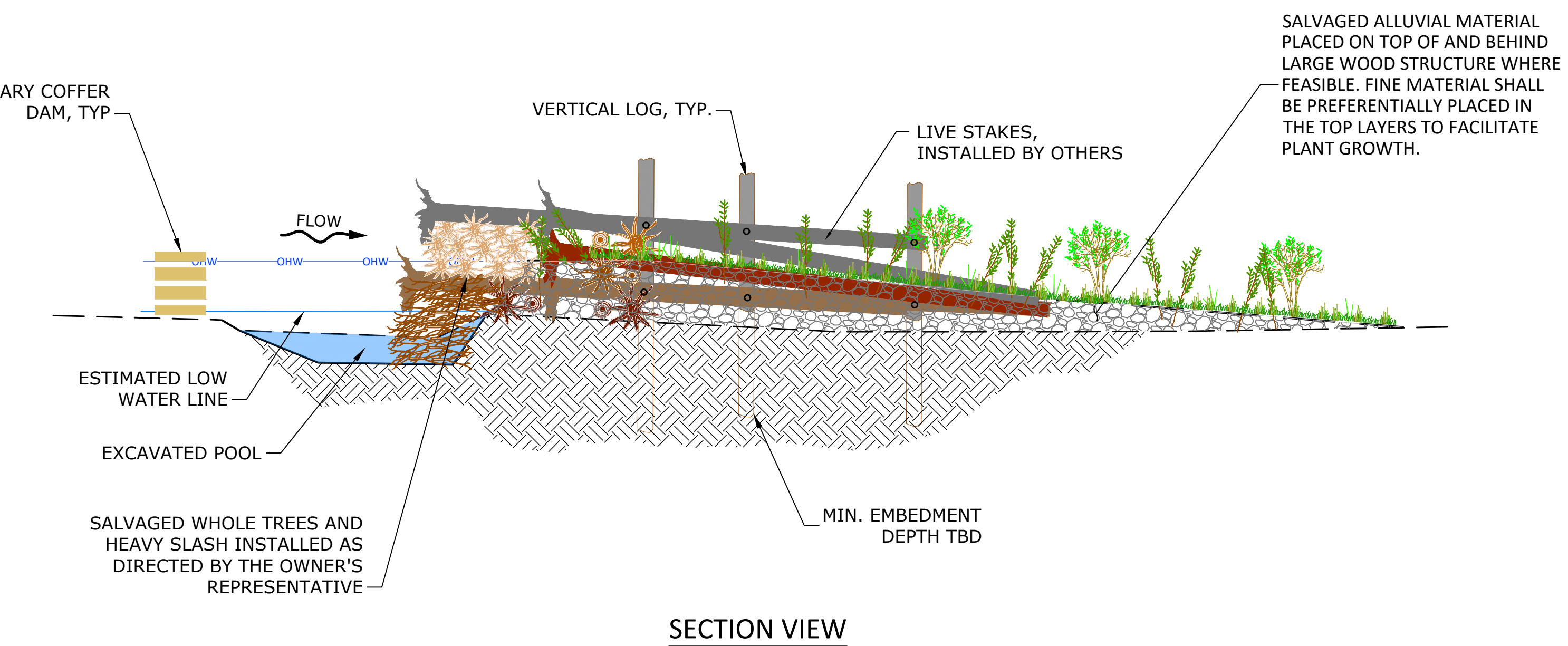
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TYPICAL DETAILS (2 OF 5)
 SHEET 14

 SHEET 14 OF 17



PRELIMINARY QUANTITIES
 RW LOGS: 30
 SALVAGED WHOLE TREES: 4
 TIMBER PILES: 12
 EXCAVATED QUANTITIES: TBD



1
15 TYPICAL DETAIL – APEX LARGE WOOD STRUCTURE
 NOT TO SCALE

LAST SAVED DATE: 2024-10-18
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 CAD SYSTEM: AutoCAD 2025 (LMS TECH)
 FILE: JFL_LOWERCHIWAWA-D_DETAILS.DWG

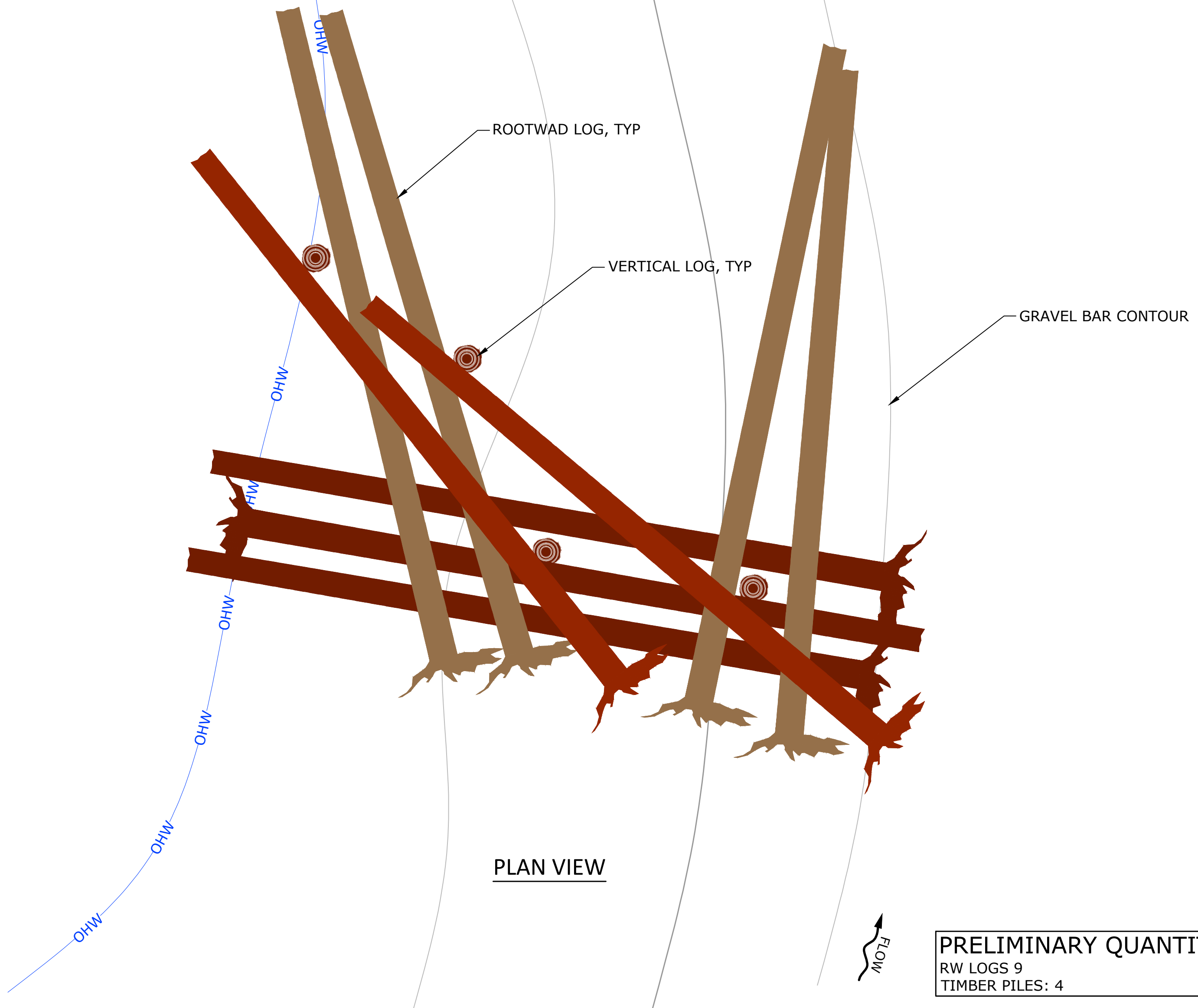
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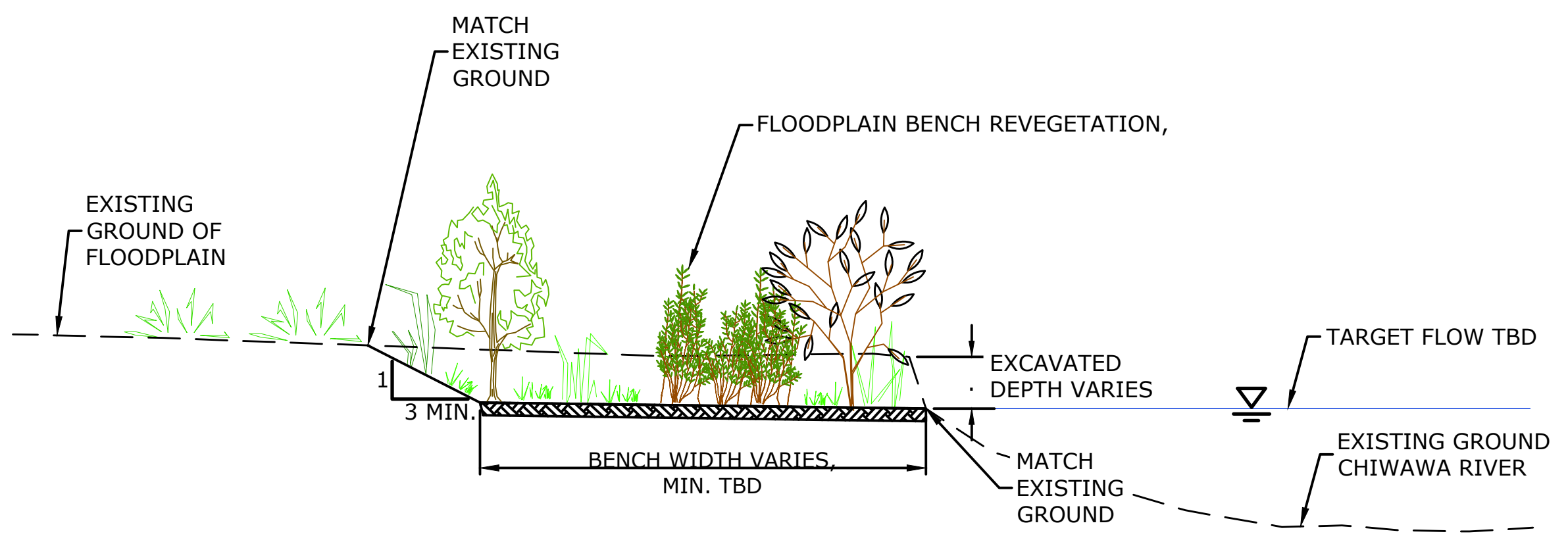
TYPICAL DETAILS (3 OF 5)
 SHEET 15
 SHEET 15 OF 17



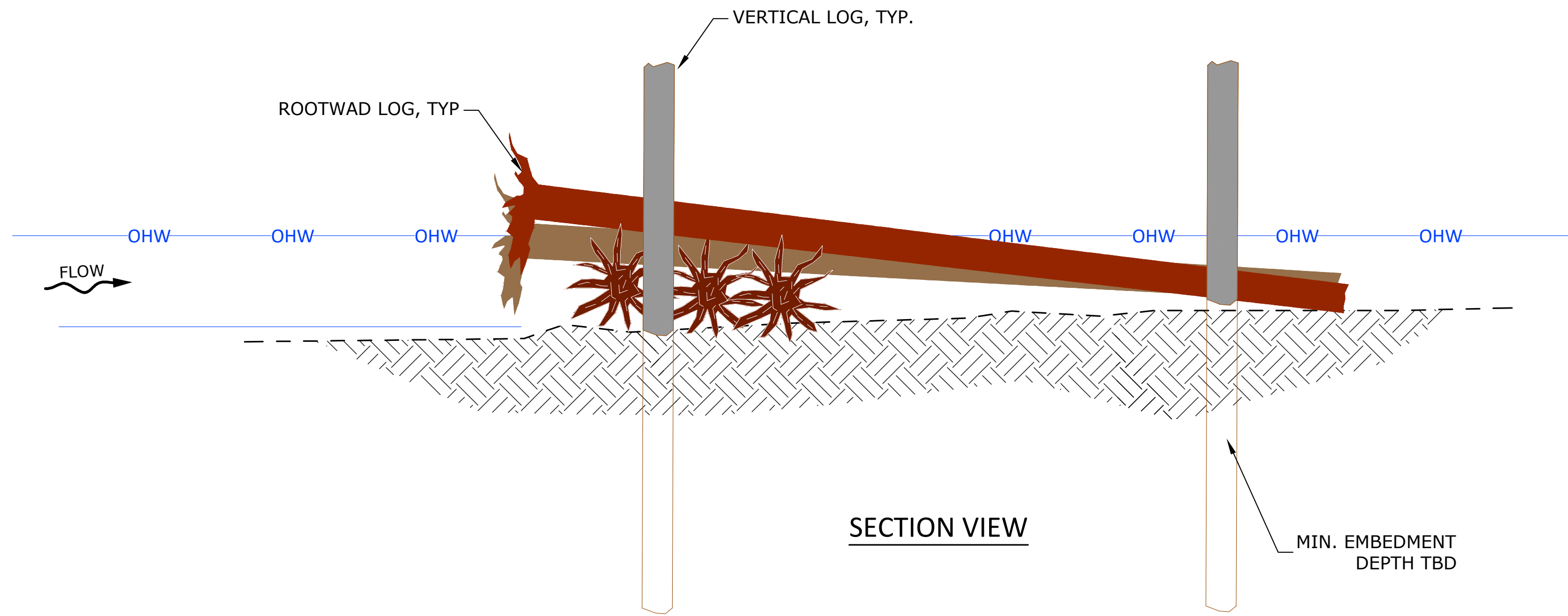
PLAN VIEW



PRELIMINARY QUANTITIES
 RW LOGS 9
 TIMBER PILES: 4



2
16 TYPICAL DETAIL – RIPARIAN BANK TREATMENT
 NOT TO SCALE



SECTION VIEW

1
16 TYPICAL DETAIL – BAR TOP ROUGHNESS LARGE WOOD STRUCTURE
 NOT TO SCALE

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OCTOBER 2024

TYPICAL DETAILS
 (4 OF 5)

SHEET 16

SHEET 16 OF 17

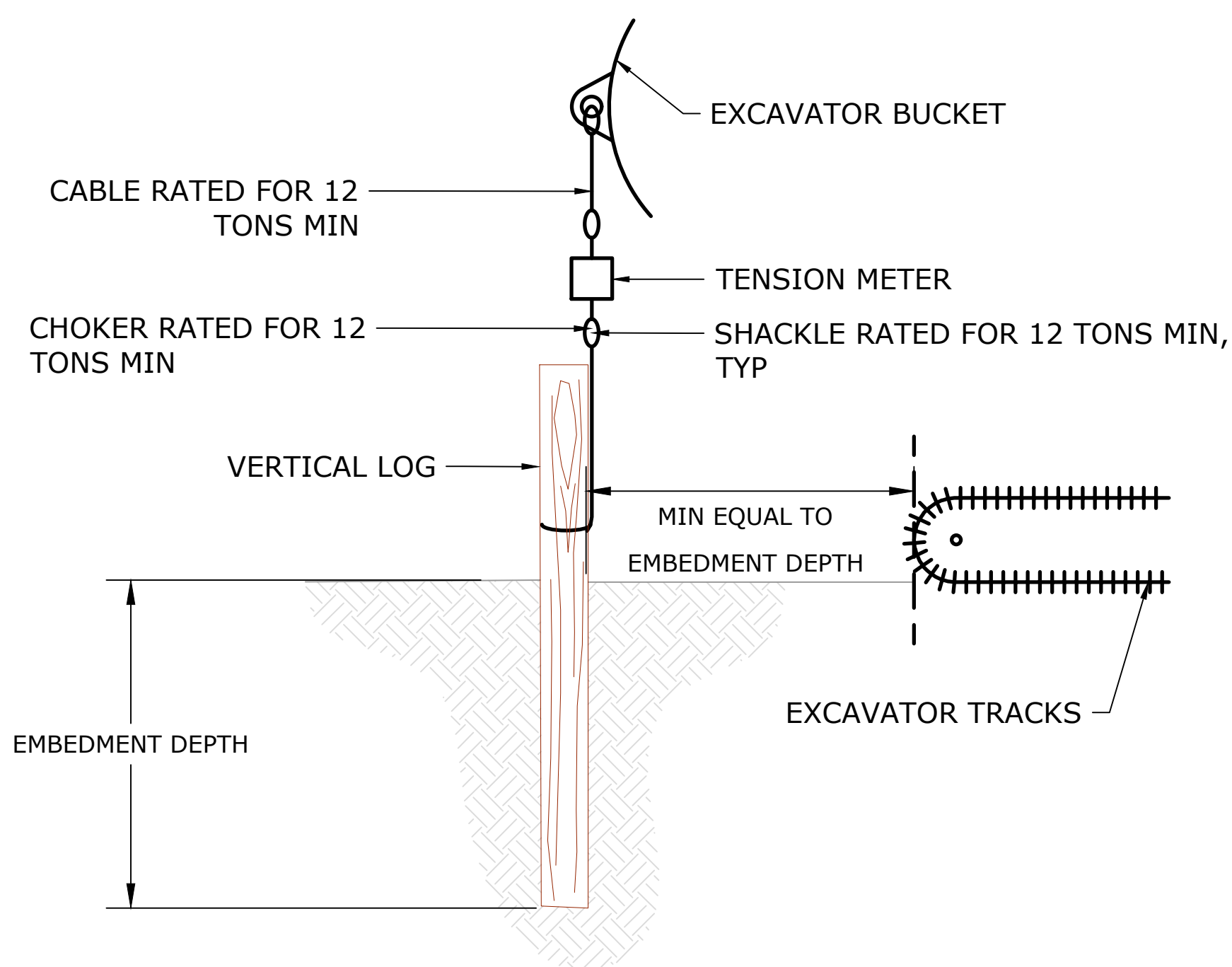
LAST SAVED DATE
 2024-10-18
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CAD SYSTEM
 AutoCAD 2025 (LMS TECH)
 JFL_LOWERCHIWAWA-D_DETAILS.DWG

Preliminary
 Not for Construction

CM DRAWN
 LS, PB ACCEPTED
 BOISE, ID OCTOBER 2024

TYPICAL DETAILS (5 OF 5)
 SHEET 17
 SHEET 17 OF 17



1 TYPICAL DETAIL - VERTICAL LOG TESTING
 NOT TO SCALE

NOTES:

VERTICAL LOGS

ALL VERTICAL LOGS SHALL BE INSTALLED USING VIBRATORY PILE DRIVING EQUIPMENT. INSTALLATION BY EXCAVATION, HAMMERING, OR VIBRATORY PLATE COMPACTOR SHALL NOT BE ALLOWED.

RIGGING

RIGGING FOR VERTICAL LOG TESTING SHALL CONFORM TO THE TENSION SCALE MANUFACTURER'S RECOMMENDATIONS.

CHOKERS, CABLES AND SHACKLES SHALL HAVE MINIMUM WORKING LOAD RATING OF 12 TONS. FITTINGS SHALL BE SIZED ACCORDINGLY

TESTING

TESTING OF VERTICAL LOGS SHALL BE PERFORMED IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE.

EACH VERTICAL LOG TEST SHALL HAVE UPWARD LOAD GRADUALLY INCREASED AND AS CLOSELY ALIGNED TO AXIS OF VERTICAL LOG AS POSSIBLE. RECORD THE VERTICAL LOG DIAMETER, EMBEDMENT DEPTH AND MAXIMUM FORCE REQUIRED TO MOVE THE VERTICAL LOG. UP TO A TOTAL OF THREE LOADINGS MAY BE REQUIRED AT EACH EMBEDMENT DEPTH.

PROOF TESTS SHALL BE MADE AT UP TO FOUR EMBEDMENT DEPTHS TO BE DETERMINED IN THE FIELD. AS A GUIDELINE TEST EMBEDMENT DEPTHS MAY INCLUDE 10 FT, 12 FT, 14 FT AND 16 FT.

EXCAVATOR CONDUCTING PULL OUT LOADING SHALL BE POSITIONED NO CLOSER THAN EMBEDMENT DEPTH OF VERTICAL LOG IF POSSIBLE. IF A CLOSER POSITIONING IS REQUIRED, EXCAVATOR SHALL BE NO CLOSER THAN THAT REQUIRED TO GENERATE DESIRED LOADING WITH DISTANCE FROM VERTICAL LOG NOTED IN THE TEST RECORD. EQUIPMENT GROUND PRESSURE MAY BE REDUCED BY POSITIONING THE EXCAVATOR ACROSS HORIZONTAL LOGS, WITH DISTANCE FROM VERTICAL LOG, LOG NUMBERS AND LENGTH NOTED IN THE TEST RECORD.

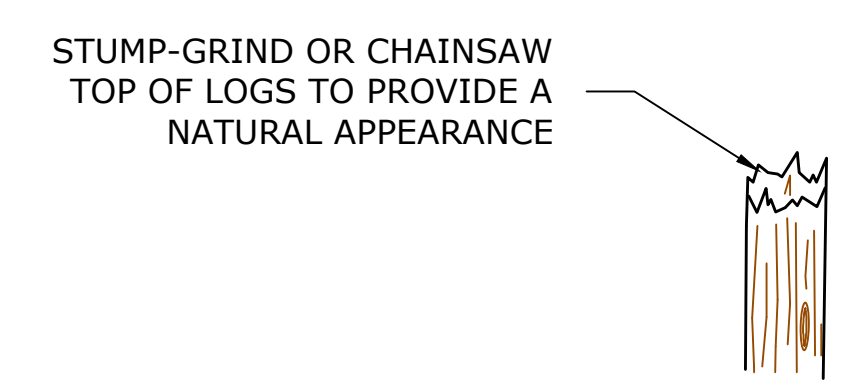
PULL OUT RESISTANCE READING SHALL BE COMPARED AGAINST EXCAVATOR MAX LIFT OFFSET TABLE.

10% OF PRODUCTION VERTICAL LOGS SHALL BE PROOF TESTED TO REQUIRED LOAD. IF RESULTS VARY MORE THAN 50% THEN IT SHOULD BE ANTICIPATED THAT UP TO 25% OF THE PRODUCTION VERTICAL LOGS SHALL BE PROOF TESTED. IF THE VERTICAL LOG EMBEDMENT DEPTH DOES NOT MEET MINIMUM, OWNER'S REPRESENTATIVE MAY REQUEST ADDITIONAL PULLOUT TESTING.

CONSTRUCTED DRIVEN VERTICAL LOG EMBEDMENT DEPTH SPECIFIED IN THE DRAWINGS MAY BE REDUCED OR INCREASED, PENDING PULL OUT TEST RESULTS, AT NO ADDITIONAL COST.

VIBRATORY DRIVEN VERTICAL LOGS SHALL INCLUDE REPOSITIONING AND MODIFICATIONS OF LOG TIP AS NEEDED FOR DRIVING AS INCIDENTAL TO THE LARGE WOOD STRUCTURE.

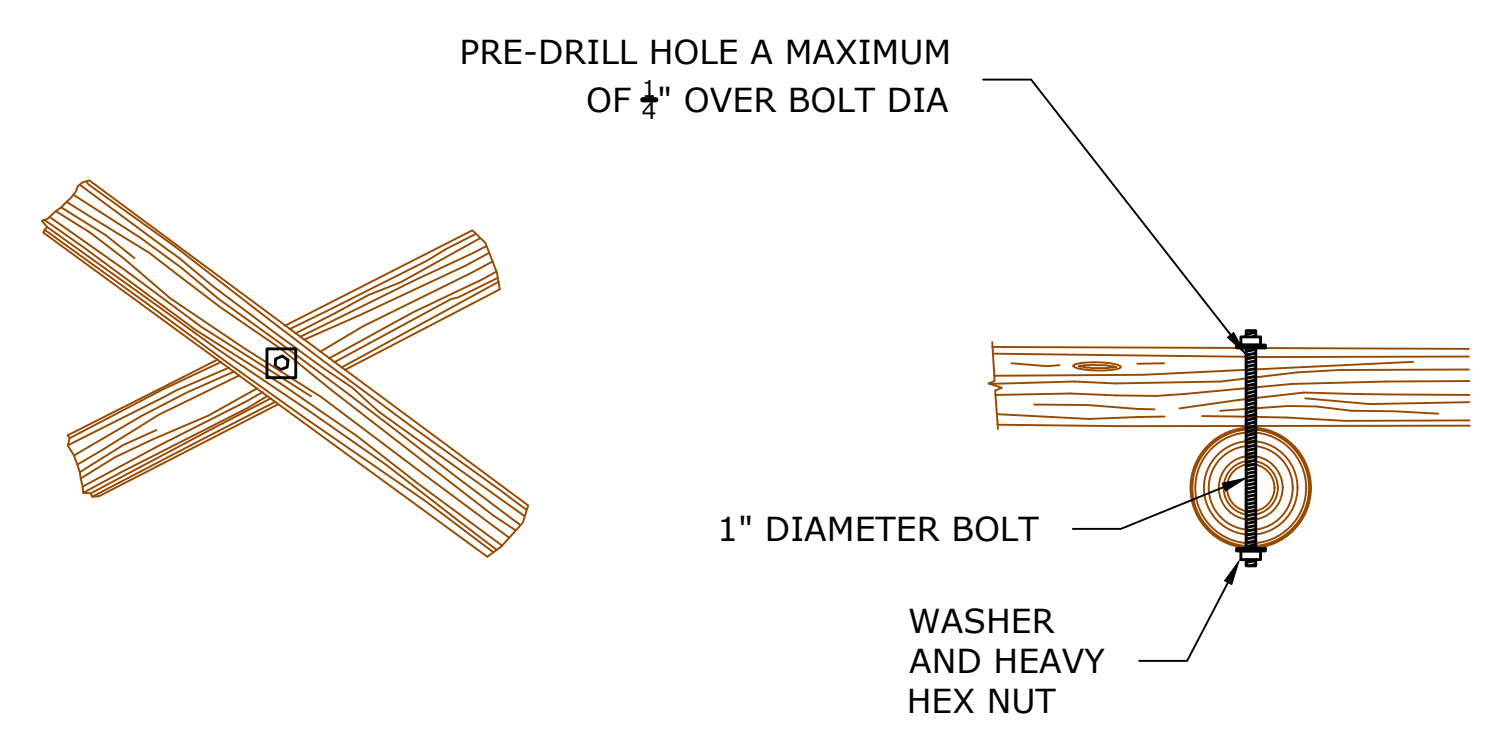
IN THE EVENT THAT 20 MINUTES OF FULL FORCE VIBRATORY DRIVING EFFORT FAILS TO EMBED LOGS TO A SUFFICIENT DEPTH TO PROVIDE 6,000 LB OF RESISTANCE TO PULLOUT, ENGINEER SHALL DETERMINE IF VERTICAL LOGS SHALL BE REPLACED OR SUPPLEMENTED WITH ADDITIONAL BURIAL DEPTH.



2 ROUGHENED TOP TYPICAL DETAIL
 NOT TO SCALE

NOTES:

1. VISIBLE ENDS OF VERTICAL LOGS SHALL BE ROUGHENED WITH A CHAINSAW, STUMP-GRINDER, OR OTHER SIMILAR METHOD PROVIDED THAT THE ROUGHENING DOES NOT COMPROMISE THE STRUCTURAL INTEGRITY OF THE LOG.
2. UNDER NO CIRCUMSTANCES MAY THE CONTRACTOR ATTEMPT TO BREAK THE TOPS OFF OF INSTALLED VERTICAL LOGS.
3. ANY VERTICAL LOGS DAMAGED OR BROKEN AT DURING ROUGHENING SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.



3 TYPICAL DETAIL - BOLTED CONNECTION
 NOT TO SCALE

NOTES:

1. BOLTS, WASHERS, AND NUTS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
2. DRILL 1-1/4" HOLE THROUGH LOGS.
3. INSERT 1" DIAMETER THREADBAR.
4. INSTALL WASHERS OVER EACH END OF THE BOLT. THREAD NUTS ONTO EACH END OF THE BOLT AND TIGHTEN THE NUT UNTIL UNDERLYING WOOD BEGINS TO CRUSH.
8. IF END OF BOLT EXTENDS MORE THAN 2 INCHES BEYOND THE TIGHTENED NUT, CUT OFF EXCESS BOLT NO CLOSER THAN 1 INCH FROM THE NUT.
9. PEEN END OF BOLT OR CHISEL THREADS SO NUT CANNOT BE BACKED OFF.
10. FILE OR GRIND OFF SHARP EDGES ON BOLT END.

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